

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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The Bollmann Metal Grinding Machine.

We show in the accompanying engraving a machine for grinding and dressing metal objects, designed by a French mechanic, M. Bollmann.

The carriage, L, on which the work is fixed, receives reciprocating motion by means of gearing moved about the axes, H, and governed by a toothed wheel having a hand brake. This toothed wheel receives motion at M from the driving pulley. The lifting and lowering of the carriage is effected by the wheel D. The small hand wheels, B and C, on the left serve to produce transverse motion of the carriage, and to regulate, by means of a spring and friction brake, the pressure with which the work is held against the stone.

The latter has a sheet-iron cap, S, and a wrought-iron guard to prevent accidents in case of its rupture. The movement of the carriage is such that the object is always presented before the wheel which rotates at the average velocity of 5760 feet per second. A second stone may be added at G, on the same spindle, being received between the flanges, for use on small work.

The remaining features of construction will be readily understood from our engraving.

The working parts are fastened to the iron bed, which is securely bolted to the standards. Bolts or screws, which can be readily removed, hold the machine firmly in place to the floor.

Scientific and Technical Notes.

Attempts to economize in fuel and labor in brick making have been frequent and in some cases highly successful. Recently

A NEW BRICK KILN

was tried at Normanton, England, which possesses a series of novel features. The kiln is 108 feet long and 8 feet broad. The raw bricks are set direct from the making machine upon iron wagons, which carry them through the entire length of the new kiln and bring them out at the exit end baked. The fires are placed in the middle of the kiln, at each side, and the draft of hot air travels toward a flue or chimney at the entrance end. By this means the bricks are gradually baked before reaching the fires, and after passing the intense heat of the central section they have time to cool before being drawn out at the receiving end, where the burnt bricks can at once be thrown into carts and railway wagons or stacked. The barrows, of which nine are in the kiln at one time, are coupled together, and the action of drawing one out advances each of the succeeding eight a stage, while at the same time pulling in a newly loaded one at the other end. Each wagon holds about 5000 bricks, making 45,000 in the kiln at once, or a total weight of about 300 tons. The wagons are made so as exactly to fit the breadth of the kiln, and, excepting the usual spaces left for the equal penetration of the heat through the entire mass, the bricks are piled upon each wagon to a height of 7 feet, thus filling up the whole space of the arch through which they pass. The iron of which the lower parts of the wagons are composed is preserved from injury through the heat, not only by the fires being on a higher level, but by a superposed layer of fire-bricks, and by a current of cool fresh air which passes under the wagons. By means of Mr. Foster's present appliances, which may be still further improved, a load of 5000 finished bricks can be drawn out in five minutes; but a period of four or six hours in the kiln is required before the bricks are sufficiently burned and then cooled enough to be taken out. It is said that the cost of fuel for burning 1000 bricks by this new process is under 6 cents, and certainly the utilization of heat seems to be in every way complete.

Zsigmondy Brothers have sunk

A DEEP ARTESIAN WELL

at Pösch, Austria, for the municipality, who desire to furnish the city with an abundance of hot water for the public baths and other purposes. The depth of the well is now 2007 feet, the temperature of the water reached being 161° F. The well now furnishes 173,800 gallons of hot water per day, which rises to a height of 30 feet. This amount of water is not only sufficient for the requirements of the city, but will also transform the surroundings of the well into a sort of tropical garden. The well is to be sunk deeper until water as hot as 178° F. has been reached. The city pays the contractors \$200,000 at the completion of the well.

Mr. Ch. Tellier, a French engineer well known by his efforts to produce low temperatures cheaply, has communicated to the Academy of Sciences his discovery of the valuable properties of

TRIMETHYLAMINE AS AN AGENT OF REFRIGERATION.

Trimethylamine has been extracted in large quantities by Mr. Camille Vincent, from the residuary liquors of the distillation of the syrup of beet roots. As it boils at a temperature of 18° F., under ordinary pressure, its vapor requires only 2 to 3 atmospheres for condensation. This property will permit in many cases the utilization of waste heat or of exhaust steam, reducing the cost of manufacture to little more than the expense of watching the apparatus, so that it is stated one ton of ice would not cost more in France than 2 to 2½ francs. Although the odor of trimethylamine is very disagreeable, the leakage of the apparatus will be but slight,

owing to the low pressure; besides, it possesses great affinity for hydrochloric acid, which thus may serve as a means of neutralizing escaping vapor.

Stark's extensive sulphuric acid works in Bohemia, which produce the Nordhausen sulphuric acid on a very large scale from aluminous slate, have lately commenced to put the pure

ANHYDROUS SOLID SULPHUROUS ACID on the market. It is put up in tightly soldered tin boxes, which were found to answer best, because at ordinary temperatures sulphuric anhydride is without action upon metals, and particularly upon tin. This form of acid is very useful, and its transportation by far less risky than when shipped in a liquid form. The constantly growing production of artificial alizarin has been

from two to three inches of argentiferous ores, and millions of crystals of tetrahydrate are destroyed by the picks of the miners, who break down the ore in that manner. The specimens of tetrahydrate brought back by Mr. Sewell are very remarkable for the unusual size and brilliancy of the crystals; some of these he has presented to the Yale Museum.

Prof. Forbes, of the Andersonian College, Glasgow, gives an interesting account of the use of

THE TELEPHONE AS AN INSTRUMENT OF PRECISION.

He used a thermo-electric intermittent current by drawing a hot end of copper wire along a rasp, completing the circuit. A telephone was put into the circuit, in another room, and every time that the wire was

submarine cables much more rapidly than at present. Probably it will be best to have the intermittent nature of the current maintained by an induction-coil, or by a spring rubbing against a continuously rotating cog-wheel, when the current is allowed to pass only when required by the depression of a key, which communicates to the listener at the receiving end the long and short dashes of the Morse alphabet. It is believed that the person who first used a thermo-electric current with a telephone was Prof. Tait.

Messrs. Stocklin & Vettliart have recently applied

A NEW SYSTEM OF PILE DRIVING.

While engaged in the work of enlarging the harbor of Calais, they found great difficulty in sinking the piles and plankings through the fine, moist beach sand. The use of water

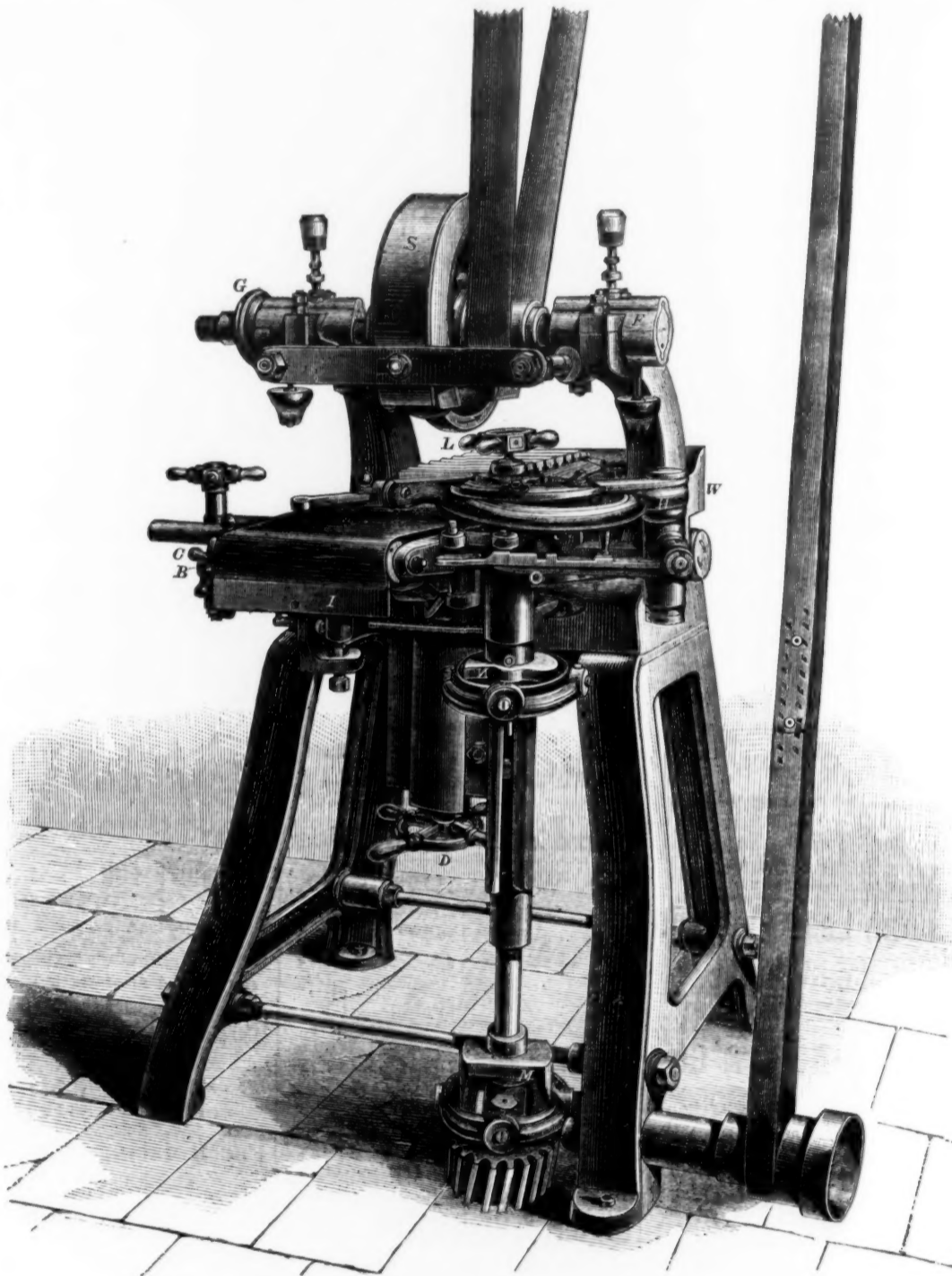
served from scale during the entire time when acted upon by the tale, but as soon as its use was discontinued a scale was produced at the end of less than one month. The tale acts entirely mechanically, presenting by its foliated structure a large surface for the deposit of the salts, and sliding down the sides of the boiler with greater facility than the clay sometimes used for the same purpose.

Russian Trade.

The *Journal de St. Petersburg* reprints from the Russian official *Indicateur du Ministère des Finances* the particulars of the import and export trade of the empire for the past year, some epitome of which is worth giving. As regards imports, we find the account almost throughout unfavorable compared with that of 1876. Russia last year imported less sugar, tea and coffee, almost no wine, little tobacco, less raw cotton, and a much smaller quantity of all kinds of woven fabrics than in 1876. The only article which shows a slight increase is steel rails, of which 187,200 tons were imported, against 174,600 in 1876; but this increase is more than counterbalanced by the decreases in all other kinds of iron. With trifling exceptions the list in short shows a decreased trade throughout. This is only what we might expect when the strain which has been on the nation is taken into account, and when it is remembered that the Black Sea ports were closed for the greater part of the year. Unfortunately no values are given, so that an average estimate of the money decrease cannot be stated. The export side of the account gives also such indications as the state of the country and of its foreign exchanges would lead us to expect. In spite of the blockade and of the appropriation of many of the railways for government traffic, the exports of last year are greater in bulk than those of 1876. Russia has even managed to export more of nearly all kinds of corn, the total exports being 22,846,000 bushels, against 18,439,000, or an increase of say about 3,000,000 imperial quarters. Linseed and hempseed, spirits and brandy, raw and refined sugar, tobacco, sheep and goats, flax, tallow, hemp and some kinds of cloth have also all been exported in increased quantities. The increased export of raw sugar is specially remarkable when taken in conjunction with the fact that in ordinary times Russia is a considerable importer. The figures are 66,200 tons, against 9000 tons in 1876. It appears from the account, as a whole, that Russia has been compelled to send everything out of the country which it was possible to send; and although it is so far a satisfactory sign for the time being that she has been able to do without much of what she usually imported, and to send away a greater proportion of her surplus raw produce, we fear the process is not one that can continue. So violent a reversal of the character of her trade must to no small extent indicate a process of exhaustion. If Russia is to maintain her credit abroad, however, she must continue for a long time to come to export much more than she imports. Her enormously depreciated paper currency would also tend to force this course upon her traders, and when to this is added her heavy debt obligations abroad, there is no possible escape from it. The danger of such a situation, however, is that the country may not be able to continue to export so much in excess of the imports. A lop-sided trade account of this kind must place a nation like Russia at a great disadvantage in competing with other nations which are capable of paying for large imports as well as of large production, and it is therefore by no means unlikely that one immediate consequence of the costly war with Turkey will be a general decline and prolonged derangement of Russian foreign trade.

In the recent great fire in Philadelphia, the greatest obstacle met by the fire department in successfully battling the great fire was the weakness of their hose, which burst cracked and unseamed from the pressure of water. For several years the Philadelphia fire commissioners have given out their hose contracts to the lowest bidder, and the result has been that utterly worthless hose has been saddled on the department for service. The eventual loss of \$2,000,000 of property may teach the lesson that should have been learned long ago, that the best hose is the cheapest, and none but the best should be allowed in fire service. At this fire several times—and at critical times, too—the hose had to be detached and new lines substituted, a delay which in one instance resulted in a total stoppage of the apparently successful efforts being made for the saving of a building on Cherry street, and which unquestionably was the cause of that building's destruction.

The question as to what is to become of the unemployed coal miners if the anthracite production is to remain at so low a figure as to throw a large proportion of the men out of work for the whole season is a serious and embarrassing one. If the men go into other pursuits it will be impossible for the operators and company to command an increased force when times improve, and the inevitable result will be a strike for higher wages. The suffering among the idle workmen is already very depressing. The problem is a troublesome one.



THE BOLLMANN METAL GRINDING MACHINE.

chiefly the cause of this innovation, it being well known not only that large quantities of fuming sulphuric acid are required for its preparation, but also that the yield and quality of the product depend upon the degree of concentration of the oxidizing agents.

Mr. Henry Sewell, a well-known mining engineer, has recently visited the famous

MINERAL CAVES OF HUALLANCA, PERU.

The silver producing caves are situated upon the eastern flank of the Peruvian Andes, at an altitude of 14,700 feet above the sea and 4000 feet above the town of Huallanca. The region was reached after an arduous journey across the Andes from the port of Casma; in the course of it, it was necessary to cross several parallel ranges, one of them 16,800 feet in altitude, and another 17,200 feet. The silver mines lie in the heart of a coal formation which has been upheaved so that the strata now stand nearly vertical. Numerous seams of coal occur near the mines. The mass of the argentiferous ores consists of the mineral tetrahydrate, and they contain about 800 oz. to the ton. The ore is obtained in the shaly portion of the formation, as well as in the sandstone. In the latter it is found in huge "vugs" or caves, many of these being as much as 25 to 30 feet long, and of about the same depth. These caves are coated with

drawn along the rasp a hoarse croaking was heard in the telephone. Then a thermopile with a Bunsen burner shining on it from a distance of 6 feet was employed. The current was rendered intermittent by the file, and the sound was most distinctly heard. A Thomson reflecting galvanometer was introduced into the circuit, which showed that the currents were extremely small. In order to try the feeblest attainable currents the thermopile was removed, and without any artificial application of heat it was shown by the galvanometer that the natural differences in the temperatures of the different junctions in the circuit were sufficient to generate feeble electric currents only just perceptible with the mirror galvanometer. These were easily detected by aid of the rasp and the telephone. Even when contact was a simply made and broken with the hand, a click was heard in the telephone. These feeble currents were rendered still more insignificant by passing them through the body of a person who held one end of the wire in each hand, and still the effects were faintly audible. Here the galvanometer, which was still in circuit, hardly gave any indication. In these experiments only one telephone is used, viz, at the receiving end. Employed in this way, with a powerful current sent from the other end of the line, we may hope to have messages sent through

to facilitate the penetration of broken iron piles, suggested its use on the outside and in advance of the wooden logs that they were using. By the help of two hand pumps the sand was loosened and held in suspension, the labor being greatly abridged. On the old plan an average of 185 blows was required to drive a pile, 900 blows for a panel, requiring, on an average, 8 hours 36 minutes. With the help of water injection, the number of blows per panel varied from 0 to 50, the mean time being only 1 hour 9 minutes; many of the panels required only from 14 to 16 minutes, and the longest time was only 1 hour 45 minutes. The extraction of displaced or broken piles or plankings, which has hitherto been attended with great difficulty, is accomplished with the greatest ease by the new system.

Talc as an Anti-incrustator.—Recent experiments made in France by Mr. Michard and Mr. Lory, of the Grenoble departmental laboratory on the use of finely pulverized talc as an anti-incrustator, have been confirmed by practical test and favorably reported on by Mr. Marié. Talc was tried by him in locomotive and stationary boilers at Rhone and Mont Cenis where the water used makes a very considerable deposit. Mr. Marié reports that new boilers or such which had been cleaned were pre-

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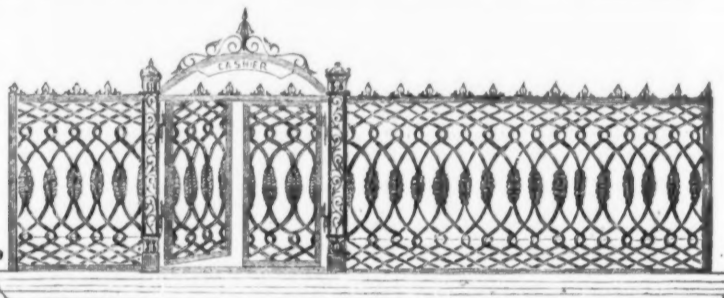
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THE PERFECTION STOVE PIPE.
Patented.
Reduction in Price.

Our large production of this article enables us to reduce prices, as will be noted below. This Pipe is rapidly gaining in favor and must eventually supersede the old style entirely. Made wholly by machinery, every joint is exactly alike, and all fit together with perfect accuracy. A child can adjust it, no tools being required. It is indispensable in the household on this account. Fifty joints of 5 inch Pipe can be packed in a case 10 inches square by 24 inches long inside, thus occupying hardly more room than Tin Plate, and securing the lowest rates of freight. The following are net cash prices, no charge for cases: 5 in., per joint, 11c.; 6 in., per joint, 12c. Other sizes in proportion. Sole manufacturers for the United States

THE CHICAGO STAMPING CO.
We shall remove May 1st to Nos. 10, 12 & 14 Lake St., Chicago.

E. C. QUINBY, President. J. C. WHITING, Secretary.
ENAMELED IRON KITCHEN WARE.
PATENTED.

STONE-IRON WARE
Made only by the
Metal Stamping & Enameling Company,
OFFICE & FACTORY, 708, 710, 712 N. Second Street, St. Louis, Mo.
ESTABLISHED IN 1848.

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MANUFACTURERS OF ALL KINDS OF
**HAMMERED AND ROLLED
STEEL,**
Warranted Equal to any Produced.

BEST REFINED TOOL CAST STEEL
For Edge and Turning Tools, Taps, Dies, Drills, Punches, Shear-Knives,
Cold-Chisels and Machinists' Tools generally.

SAW PLATES
For Circular, Mulay, Mill, Gang, Drag, Pit and Cross-Cut Saws.
Sheet Steel
For Springs, Billet Web and Hand Saws, Shovels, Cotton Gin Saws,
Stamping Cold, &c., &c.

SIEMENS-MARTIN (Open-Hearth) PLATE STEEL
For Boilers, Fire-Boxes, Smoke Stacks, Tanks, &c.
All our Plate and Sheet Steel being rolled by a Patented Improvement is unequalled for surface finish and exactness of gauge.

ROUND MACHINERY CAST STEEL
For Shafting, Splindles, Rollers, &c., &c.
File, Fork, Hoe, Rake, R. R. Frog, Toe-Calk, Sleigh-Shoe and Tire Steel, &c.;
Cast and German Spring and Plow Steel.

"Iron Center" Cast Plow Steel, Finished Rolling Plow Centers with Patent Screw Hubs attached.
"Soft Steel Center" Cast Plow Steel, Agricultural Steel cut to any pattern desired.
"Solid Soft Center" Cast Plow Steel. Steel Forgings made to order.

Represented at 59 BECKMAN ST., NEW YORK, by
HOGAN & BURROWS Gen'l Agents for Eastern and New England States.

THE "CAY DECEIVER."
Best Catch-Alive Mouse Trap.

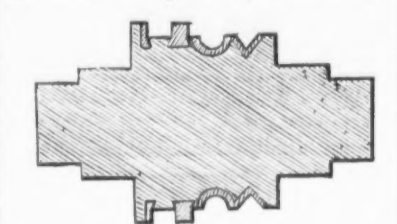
The Most Taking Novelty of the Season.
BUY NO OTHER PATENT TRAP.
Per gross, cased, \$18.00; cases free.
Less quantity, \$2.00 per dozen.
Don't wait for our agents, but secure the cream of the trade. First come first served.
Circulars free. Sample Trap, prepaid, 25c.
A handsome show card in each case of Traps.

RIPLEY MFG. CO.,
Unionville, Conn., U. S. A.

THE CELEBRATED DECOY TRAP.
E. OLIVER,
106 & 108 Beckman St., N. Y.,
Manufacturer of
Wire Cloth and Netting, Moulders'
Riddles, Patent Decoy
Rat Traps.

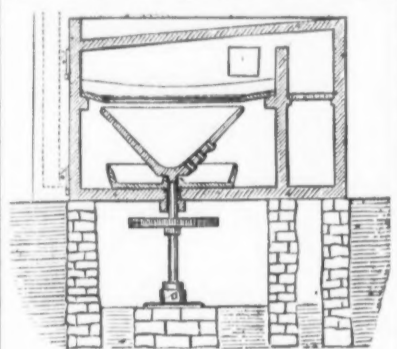
The Largest Screen and Flour Sieve
Factory in the United States.

New Patents.
We take the following abstract of new patents, recently issued, from the official record:
ROLL FOR ROLLING METALS.
To David Jones, Youngstown, O.—Jan. 22.
—A roll for rolling metals, which consists



of a cast-iron body and wrought iron or steel collars, said collars secured to the body in the process of casting the latter.

SEPARATING MOLTEN METAL.
To F. J. Seymour, Wolcottville, Conn.—Jan. 22.—The flame passes over the melting



hearth, or down through the central opening therein, and around the melting pot at will. The metal melts, and runs down through the central opening in the concave hearth into the melting pot, where it is kept molten by the flame surrounding the pot. A vertical jolting motion is given the latter as it revolves. The molten metals arrange themselves according to their specific gravities, and are tapped off into the trough. The heat is regulated so as to melt the more fusible metal first, &c.

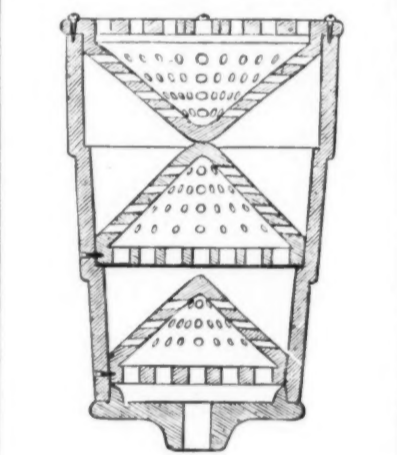
1. The described method of separating metals, which consists in subjecting a molten mass of the combined metals in a containing vessel to a jiggling or settling motion, whereby the metals are arranged according to their relative specific gravities, and may be separately drawn off.

2. The combination, with a pot for melted metals and a shaft for sustaining the same, of the gearing for rotating the pot, and the cam teeth for raising the pot and allowing it to drop.

3. The inclined hearth of the reverberatory furnace, having a bottom outlet or opening, in combination with a collection pot located beneath said opening, a chamber beneath the hearth containing said pot, and flues and dampers, substantially as set forth, whereby the furnace flame is either conveyed over the hearth to the chimney, or down through said hearth and around the pot.

DEVICE FOR ABSORBING THE NOISE OF ESCAPING STEAM.

To Geo. H. Buzzell, Boston, Mass.—Jan.



22.—The silencer absorbs the noise of escaping steam, and may be attached to the exhaust steam pipe of railway car brakes or steam engines.

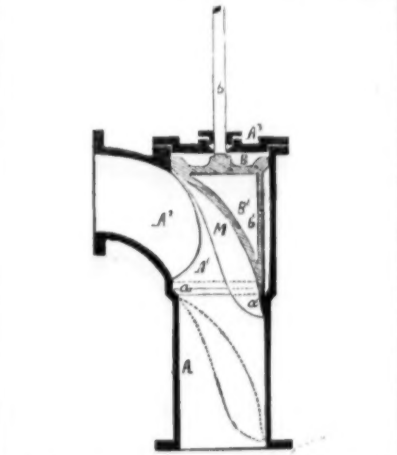
1. The case or shell of increasing area, in combination with a series of perforated diaphragms and cones.

2. The combination, with a shell or case of a silencer, of a series of cones, perforated as described.

3. In a silencer, a cone perforated with holes running at right angles to a line drawn longitudinally through the center of the case.

STOP VALVE.

To Jas. T. Fifield, Brooklyn, N. Y.—Jan. 29.—1. The valve B, having the extension



B', with its smoothly-hollowed face M, in combination with a pipe or fluid passage, A, and angular arm or bend A', adapted to

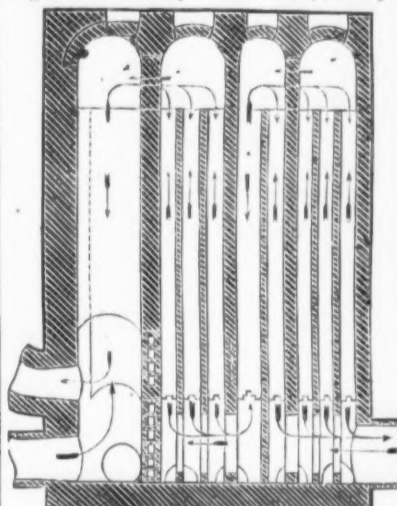
form a smoothly-curved passage for the fluid.

2. The chamber A', larger than the pipe A, in combination with the branch or arm A'', and with the valve B, having a wedge-like extension, B', of smaller diameter, adapted to move in part A, and allow the main body B to come to a tight bearing on the annular seat a.

3. The pipe A, smaller than the chamber A', and provided with the projection a', in combination with the branch A'' and valve B, having the groove b' and hollowed surface M, substantially as described.

APPARATUS FOR HEATING AIR AND GASES.

To Thos. Whitwell, South Stockton, England.—Jan. 22.—The heating apparatus (through which the burning gas and the air or gas to be heated pass alternately, in op-



posite directions, in contact with the same surfaces) constructed with transverse vertical walls or partitions, crossing from side to side, and arranged in series or sets, forming divided passage ways, which are connected with each other alternately at top and bottom, and extend across the apparatus, whereby friction is lessened, while heating surfaces of the width of the apparatus are provided.

FIRE-PROOF COLUMN.

To Peter B. Wight, Chicago, Ill.—Jan. 29.—1. In a fire-proof column constructed as described, the protecting gores B, provided with the grooves b.



2. The combination of the grooved gores with the continuous flange a.

3. The combination of the grooved gores B and continuous flanges a, when constructed and arranged as described, with the grouting material filling the interstices between the same, for the purpose of securing the gores firmly in place.

4. The combination of the cementing material with the gores B and the continuous T-shaped flanges, when arranged to fill the space between the same out or near to a line with the exterior surfaces of the gores.

Illuminating Factories by the Electric Light.

In the works of the Union Screw Company, on Case avenue, Cleveland, a few evenings ago, a party of ladies and gentlemen assembled to witness the trial of an electric light. The apparatus employed was invented by Mr. Chas. F. Brush, of Cleveland. It consists of a Brush dynamo-electric machine of 12,000 candle-power, arranged to give four separate currents, each running an electric lamp of 3000 candle-power. Two of the lamps were placed on the third and two on the fourth floor of the immense building, and when the engine was started up the machine started at the same time, and, without the slightest manual interference, the lamps flashed out their light in all its magnificence. The effect was most brilliant. The rooms were flooded with a pure white light like the light of the sun, and it streamed out at all the windows, illuminating houses and streets for a long distance in every direction. The light was very uniform and steady, free from the flickering that used to be an accompaniment of electric light, and, considering the enormous illuminating power, the light was unexpectedly soft and endurable to the eyes. An opportunity was afforded to test the character and whiteness of the light. Worsteds, scarfs, afghans, &c., of brilliant shades were hanging against the wall at one side of the room, and it was noticed that the colors were brought out as clearly as by the full light of the sun. Estimates were made as to the amount that the light furnished by this apparatus would cost, if used by the screw company as it was used on this occasion, and it was ascertained that the total cost of the whole light from the four lamps, including the items of consumption of carbon in the lamps, interest on the investment, and wear and tear, would not exceed 30 cents per hour. The light produced was photometrically equal to 800 gas burners, burning 5 feet of gas per hour each. This amount of gas would cost \$5 per hour. The great saving is at once apparent.

French Coal Mining.—The production of coal in the French department of the Nord in 1877 was 3,216,939 tons, as compared with 3,303,066 tons in 1876. The number of workmen employed in coal mining in the Nord in 1877 was about 20,000, of whom 14,000 were in the service of the Anzin Company alone. The cost of raising each ton of coal in the Nord in 1867 was 8/10 per ton; the selling price ranged during the year between 10/ and 10/5 per ton. The production of coal in the French department of the Pas-de-Calais last year was 3,423,981 tons, as compared with 3,336,768 tons in 1876.

Iron.
NEW YORK.
OGDEN & WALLACE
SUCCESSORS TO GAIL G. SMITH & CO.,
IRON & STEEL,
85, 87, 89 & 91 ELIST ST., N. Y.
AGENTS
MIDVALE STEEL WORKS.
A full assortment constantly on hand of
Cast, Machinery, Tool, Spring, Tire, Sleigh
Shoe, Toe Calk, Plow and Blister Steel.
Orders solicited for
Steel Tyres and Axles,
Steel Forgings and Castings.

PIERSON & CO.,
24 Broadway, New York City.
Iron & Steel.
COMMON & REFINED IRON,
Hoops, Rods, Scrolls, Bands, Orals,
Horse Shoe, Nail Rods,
Steel, &c.
Orders promptly filled from stock.

J. H. JACKSON & CO.,
206 & 208 Franklin St., N. Y.
Importers and Dealers in
IRON and STEEL.
Agents for
JOHN A. GRISWOLD & CO'S
Bessemer Steel.
MACHINERY STEEL,
Cast Steel and
SPRING STEEL,
ANGLE and T IRON.
Special Irons for Bridge and
Architectural Work.

ABEEL BROTHERS,
Established 1765 by ABEEL & BYVANCK,
Iron Merchants,
190 South Street and 365 Water, N. Y.
ULSTER IRON
A full assortment of all sizes constantly on hand.
Refined Iron,
Horse-Shoe Iron,
Common Iron.
Band, Hoop and Scroll Iron.
Sheet Iron.
Norway Nail Rods.
Norway Sha. es.
Cast, Spring and Tire Steel, etc.

A. R. Whitney & Bro.,
Manufacturers of and Dealers in
IRON,
56, 58 & 60 Hudson,
45, 50 & 52 Thomas, and
12, 14 & 16 Worth Sts., NEW YORK.
Our specialty is in
Manufacturing Iron Used in the Con-
struction of Fire-Proof Buildings,
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Plans and estimates furnished, and contracts made
for erecting Iron Structures of every description.
1000s containing cuts of all iron made sent on ap-
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Sample pieces at office. 58 Hudson Street.

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Wm. Borden,
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Agents for the sale of
Fall River Iron Co.'s Nails,
Bands Hoops & Rods
AND
Borden Mining Company's
Cumberland Coals.

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LAP WELDED BOILER FLUES,
Boiler Rivets, Angle & T Iron, Cut Nails & Spikes.
Agency for Pottsville Iron Co., Vindicator Iron Works,
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Sole Agent for Sweet's Toe Calks.
Constantly on hand, Refined and Common Iron, Horse
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Also SPRINGS, AXLES and BOLTS.
For Truck and Carriage Makers.

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Brands of Iron. Also all descriptions of Plate, Sheet,
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ROLLING MILL.
JOHN LEONARD,
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HORSE SHOE IRON,
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Cold Blast Charcoal Scrap Blooms,
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CORRUGATED SHEET IRON
For Roofing, &c., Galvanized, Plain or Painted.
Best Charcoal, Best Refined and Common
SHEET IRON.
Plate and Tank Iron,
C No. 1, C H No. 1, C H No. 1 Flange, Best Flange
Best Flange Fire Box, Circles.
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Stamped and Guaranteed.
All descriptions of Iron Work Galvanized or
Tinned to order.
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OLD METALS.
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SCOTCH AND AMERICAN
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Wrought & Cast Scrap Iron,
OLD METALS.
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Swedish & Norway Iron.
A Variety of Brands, including
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BARS suitable for Steel of all grades, Wire, Shovels,
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CHARCOAL PIG IRON for Bessemer and
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Scotch and American Pig Iron, Wrought, Cast and
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Wrought Iron; also old Copper, Composition, Brass,
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Iron
Boiler Rivets.

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Manufacturers of every description of
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Planished Sheet Iron.
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Guaranteed fully equal in all respects to the
IMPORTED RUSSIA IRON,
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HEAVY AND LIGHT FORGINGS
Of all kinds
FOR CARS, LOCOMOTIVES AND ENGINES,
Including Drawbars, Axles (either hammered or
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Our Rolling Mill and Nail Factory having been remodeled, possess all modern improve-
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Facilities complete for First-Class Work at very Low Prices.
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SHEET and TANK IRON—BOILER, TANK and SAFE RIVETS,
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made from Selected Scrap Iron, especially for Boiler Plates.

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Wrought Scrap Wanted
 at lowest cash price.

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 Pumps & Boilers, Copper, Brass,
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 Cash paid for all kinds of Metals and Tools.

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MINERS AND SHIPPERS OF

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The "BLUE" (Red Short) and "RED" (Neutral) Bessemer Ores, from Hacklebarney and Chester, New Jersey.
 Price "Blue" Ore hand-broken and selected for April is \$2.50 cash, f. o. b. Hacklebarney Mines.
J. WESLEY PULLMAN, Treas., 407 Walnut St., Philadelphia.

The Cambria Iron and Steel Works,

Having enjoyed for over TWENTY YEARS the reputation of producing the best quality of

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have now an annual capacity of

100,000 Tons of Iron and Steel Rails, Splice Bars, &c.

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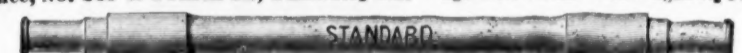
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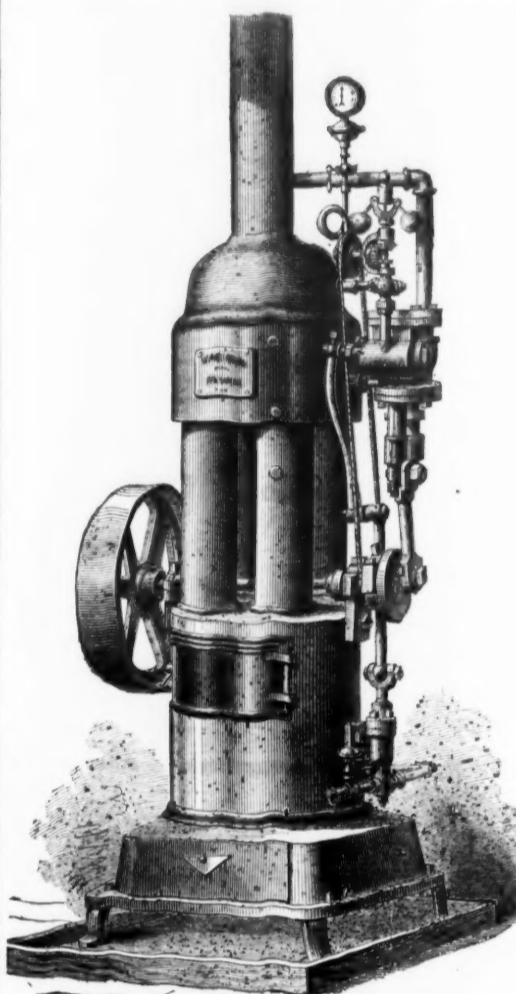
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The New Baxter Portable Engine.

Mr. William Baxter, well known as the inventor of the "Baxter" engine, has just completed a new portable engine and boiler which we illustrate upon this page. The engine is of one horse-power, and is complete with boiler, feed pump, steam gauge, gauge cocks, governor, &c. The boiler consists of two cast-iron boxes connected by large tubes. Inside of these vertical tubes are smaller ones of wrought iron, lap welded, and put in with an expander, through which the gases and smoke pass up to the chimney. The fire-box, which is surrounded by water, is in the lower box. The construction is made plain by a glance at the engraving. The engine is attached to the side of the boiler, the shaft running directly across the lower part between the tubes. The valve is of the pattern known as the rotary D-valve. The eccentric which drives it is also made to drive the pump which is situated just below it. The cylinder is fastened directly upon the upper portion of the boiler. The guides are formed of two round rods projecting from the cylinder cover on each side of the connecting rod. The base on which it stands is 2 feet square.

**THE NEW BAXTER PORTABLE ENGINE.**

and the whole machine is 4 feet high. There is a rocking grate for the furnace and the usual check and stop valves on the pump. The cylinder is 3x3 inches, which the manufacturer rates at one and a half to two horse-power. The entire weight is 650 pounds.

In regard to the work which one of these engines can do, the *Passaic (N. J.) Herald* says: "We have a very heavy Cottrell & Babcock cylinder press of the largest size they make, and this little engine has run this press ten hours on a scuttle of hard coal." We believe the engine also drives a "Gordon" press as well. This illustrates very well the power of the engine. The manufacturer is Mr. J. C. Todd, the successor of the well-known firm of Todd & Rafferty, of Paterson, New Jersey. The New York office is at No. 10 Barclay street.

Type Setting Machines.

The Pratt & Whitney Company of Hartford, says the *Boston Commercial Bulletin*, have made 13 pairs of type setting and distributing machines for a New York printer, under the direction of an expert employed for the purpose. The machines are at work in New York, and are reported in general terms to behave themselves satisfactorily. The distributor occupies a space about five feet square and three high. The setter is a little larger. The complexity of each is alarming, the nicety of detail required is disheartening, but the perfection of the accomplished fact is amazing. For example, in the distributor there are 200 little blocks of steel, each a complex machine by itself, and differing from the other like Yale lock keys, traveling around a race course, where 100 of them (continually dismissing one and taking another) must always occupy 30 inches precisely. Variations of one one-thousandth of an inch in their thickness would be fatal to their usefulness. So far as appears the machines ought to succeed. The *Hartford Courant* inquires concerning them: For what price can they be sold? How much skill does it require to run them? How frequent are the stoppages? How much trouble and expense are required for repairs? In short, the old question—prove what you claim, and all large printing offices will take machines.

So much money has been spent in an apparently bottomless pit in search of machines of this class that practical printers look with incredulous pity upon one who says he has found the secret, as upon one who says he has squared the circle, started perpetual motion or found the philosopher's stone. They are quite willing to promise anything upon the condition that a good machine should be brought along. They think it like contracting to take an unlimited quantity of green cheese when the inventor shall have got hold of the moon. But they do say this

time that the machines will work, and the proof is, they are working.

Portable Cylinder Borer.

One of the greatest accessories to the efficient and economical working of engines and other machinery of a similar nature during a long period of years, is to be found in the ease and celerity with which various portable tools can be applied and used in the repair of worn or defective parts. Prominent among this class of tools, and adapted to an almost innumerable variety of requirements, is the portable cylinder borer, made and operated by the firm of L. R. Flanders, 1025 Hamilton street, Philadelphia.

It consists of a revolving bar, carrying a traveling head and cutters, which traverse from one end of the cylinder to the other as fed by the feed screw, running down the side of the bar. The bar is set central, at one end by means of a set-screw adjustment in a plate or bracket, which surrounds it, and is clamped to the cylinder flange; at the other, it rests upon a center piece, which is jammed in place by three or four taper gibs, forced into the stuffing box by screwing up a nut on the extremity. If it is impracticable to use the stuffing box as a guide, there is an expanding apparatus operated by a cam which is applied directly to the bottom of the cylinder and supports the end of the bar, as before. An adjustable bracket carries the driving gear and the attachment for the power, which may be a hand crank for small jobs, but on large work it is a pulley driven by any convenient power or by a small portable engine. When this bracket is in the required position it can be clamped firmly in place as long as necessary. On top of the bar is a casing containing the feed gear, which may be changed to increase or diminish the feed, or reverse it, by shifting an intermediate in a manner similar to a lathe.

The readiness with which the apparatus can be applied is remarkable. We had the pleasure within a few days of personally witnessing its operation on the high-pressure cylinder of the steamer *Indiana*, of the American line. This being a 57-inch cylinder it required a tolerably heavy bar, &c., yet within an hour or two from the time it was laid on board it was set and ready for a cut, and the work went on in the most regular and steady way.

The expense, difficulty and, it might almost be said, utter impracticability of moving large castings of this kind, which have also to be carefully reset, make a portable apparatus like the one mentioned an indispensable requisite of modern advancement in mechanical appliances, and, while it performs so important a function in this respect, it is not the less valuable for a smaller class of work; and admitting of a range of bore from 3 to 110 inches, as now made, it has proved very efficient in the repair of Corliss valve seats, pumps of various kinds, steam hammers, pedestal boxes in position, and a variety of other uses increasing almost daily.

Pig Lead from Smoke.—The *Joplin (Mo.) Mining News* explains its recent statements that pig lead is being made from smoke as follows: In the process of smelting the ore a great deal of it escapes in the form of smoke, or lead fumes, as it is more properly termed. It has been known for years that a large percentage of the metal was thus lost by its being sublimed and passing off into space. The White Lead Company was organized for the purpose of catching this smoke and by passing it through an almost endless line of pipes of sheet iron and wooden bags to condense it. The result was that after an outlay of many thousand dollars and a year's experimenting they have succeeded in condensing the smoke, or lead fumes, into metallic lead, the same as steam is converted into water. The product of the fumes is a bluish, impalpable powder, which makes a splendid blue paint, pronounced equal to the corroded article. For the purpose of making it white several furnaces were built, and the blue product, with the aid of an immense heat, is again changed into lead fumes, which is again condensed and comes out pure white lead. In the transforming of the blue lead into fumes considerable pig lead is made. The object is to sublime it all, but the heat is not powerful enough to do so.

The Hon. Charles O'Neil of Philadelphia is in receipt of an article from Minister Welsh, at London, on "Our Wealth in Relation to Imports and Exports, and the Causes of Decline in the Latter," written from a British standpoint by Ernest Seyd, a distinguished writer on economic questions, and published in the *Journal of the Society of Arts*. Mr. Seyd predicted that the demoralization of silver by Great Britain would bring calamity upon the country, and in the present paper Mr. Seyd sees all his prophecies fulfilled. He does not, however, attribute all the distress to the demoralization of silver. He charges much of the responsibility on the policy of free trade, and suggests that the salvation of the country lies in a return to the protective policy. He points to the terrible decline in exports—\$365,000,000 in the past year—as a strong argument against the British policy of free trade. He declares that there is a growing feeling in Great Britain in favor of protection.

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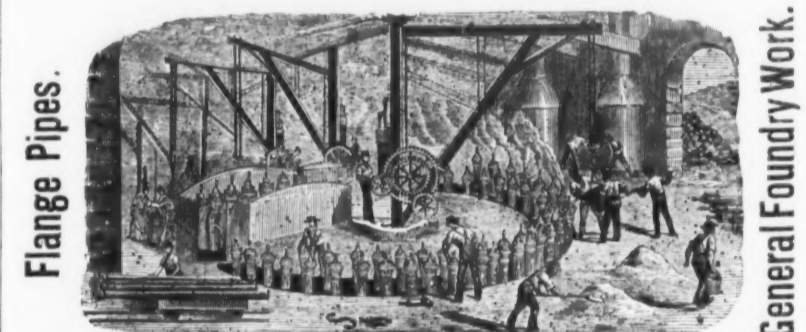
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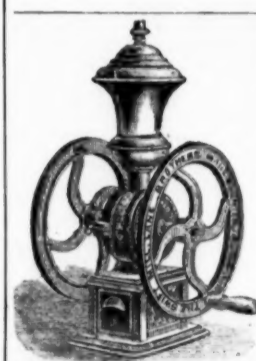
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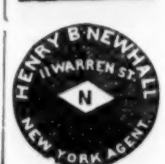
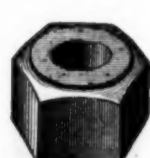
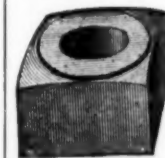
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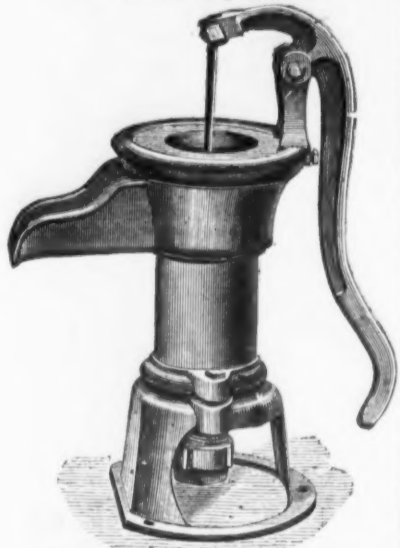
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17 Fine Castings a Specialty.

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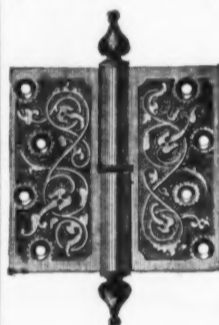
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- 4th. For their Economy in Construction.
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PULLEY BLOCKS,

AND

SAFETY HOISTS.

YALE LOCK MANUFACTURING CO., Stamford, Conn.

Coal Washing in the South.

A correspondent of the Nashville *American*
sends the following from Helena, Ala-
bama, under date of April 15:

Last October, Col. J. W. Sloss, president,
and James Thomas, general superintendent,
of the Eureka Company, of Oxmoor, Ala.,
were at Pittsburgh, Pa., to see the working
of some coal-washing machinery in opera-
tion at that place, and, after a careful ex-
amination, concluded to erect Mr. S. Stutz's
coal washer, as being the best in the market.
About a month later the inventor of the
machinery came here to see the location of
the mines, &c., and together with the super-
intendent selected a place immediately op-
posite the company's coke ovens. The ma-
chinery is now in full operation and proves
as great a success in cleaning the Alabama
coal from its impurities as it does in Pitts-
burgh.

The annual meeting of the stockholders
was held at Oxmoor on the 10th inst., and
they repaired *en masse* to Helena to witness
the working of the machine. They were
satisfied that it would perform all that was
claimed for it. The apparatus is not a
crude idea enveloped in a maze of machin-
ery, but the result of many years of labor
and observation, coupled with the skill and
experience of a mining and mechanical en-
gineer. The whole of the machinery is com-
posed of two distinct parts—the crusher and
the separator. The former is located on the
second floor just above the separator box,
and has for its object the preparation of the
material by crushing the larger pieces of
coal to a uniform size of from one-eighth to
one-fourth of an inch, according to the
quality. There is no revolving drum to
classify the various sizes of coal and feed
them into corresponding washing boxes, as
used in the old washing machinery, nor is
there any kind of scrapers to deliver the
separated coal out of the box. All is done
at one operation, and in the most simple
manner possible. The slack coal, which is
brought by the railroad to the works, passes,
previous to its introduction into the separa-
tors, through the crusher. The latter is of a
peculiar construction and has two pairs of
rolls; the upper pair is corrugated, to break
the lumps, while the lower rolls are smooth,
for the purpose of reducing the coal to small
pieces. On leaving the crusher the whole
mixture of fine coal and slate slides down
an inclined plane to the rear end of the
separator sieves. These, two in number, are
made of brass wire, and are 3x1½ feet.
The box of the separator is constructed of
3-inch boards, and the separation, based on
the principle of the difference in the specific
gravity of coal, sulphur, &c., can be
called almost an absolute separation of the
carbon from the impurities.

An elevator provided with buckets takes
the washed coal away as it comes out of the
separator and carries it up to a trestlework,
over which it is conveyed to the coke ovens.
From 200 to 300 tons of slack can be
handled and washed per day by the ma-
chinery, at a cost of from one to two cents
per ton.

Although the coal mined by the Eureka
Company is not an impure coal, it contains a
considerable quantity of slate, coming mostly
from the roof and bottom of the vein, and
some sulphur. The greater part of the lat-
ter is deposited in the shape of fine leaves
and less in pyrites. The work of separating
this sulphur from the coal has heretofore
been a matter of much difficulty, which,
however, seems to have been thoroughly ob-
viated by this machinery, which is the in-
vention of Mr. S. Stutz, a mining and me-
chanical engineer of Pittsburgh. The coke
manufactured from the washed coal is hard
and resonant, of nearly a silvery color, and
surpasses, in its freedom from sulphur and
ashes, the best "Connellsville" coke.

Parties desiring more information about
coal washing might do well to consult *The
Metallurgical Review*, Vol. I., David Wil-
liams, New York, in which several articles
with numerous illustrations have been pub-
lished.

Rich Gold Discoveries in Arizona.

Great excitement is being created in the
Territory by the discovery of extremely rich
gold lodes in Pinal county, Arizona. The
Yuma *Sentinel*, whose editor, Mr. George
Tyng, is very well informed, says of the
discovery of ore assaying \$44,500 per ton:

It has actually been found in considerable
quantity; we have seen the certificate of
assay which gives the value in gold as \$42,
873, and in silver \$1649.43. Selected speci-
mens shown us could assay three times as
much, as they contained at least one-third of
their weight in gold. The discovery was
accidental, and occurred in this wise: On
February 4th Col. S. A. Buckingham went
out to look at, with a view to bond or pur-
chase, certain mines located in Pioneer Dis-
trict, in Pinal county, owned by Buck &
Hayes, who accompanied him. On their
return they were accompanied by D. Dunn,
it being late in the day, they struck across
the country, hoping to reach the Silver King
and Globe trail before dark. All four were
mounted. While forcing their way through
the brush, along the middle fork of Pinal
Creek, at a point some three and a half or
four miles north of Andy Hawkin's Pinal
ranch, and some 16 miles west of Globe, one
of the party dismounted. He soon cried out,
"Boys, here's gold!" At first the others
thought he was joking, but his persistence
caused them to turn back, when, sure enough,
there were the richest auriferous float and
croppings perhaps ever discovered. Closely
examined, this rock is found to be thoroughly
decomposed quartz, held together by a per-
fect sponge of fine wire gold. Oxidation
of its silver alloy has so discolored the gold
that it might escape a casual glance, but the
least friction reveals its true character.
Specimens broken from the ledge carry their
normal color, and are brilliant with gold.
The ledge occurs on the side hill, about 500
feet above the bed of the creek, which car-
ries a constant stream of pure fish-support-
ing water. It has been traced for a great
distance, and ten locations, of 1500 feet
each, have been made upon it. * * *

We shall soon learn whether this bonanza is
a mere freak of nature, or really a mine that
carries ore of the unprecedented value of
over \$40,000 per ton. But, in any event,

the croppings of the float alone will make the
boys rich. The excitement in that country
is now immense, and prospecting has re-
ceived a fresh impetus. Almost the entire
water-shed of Pinal Creek and its branches
is covered with dense thickets of entelacy
and similarly stubborn bushes. This fact
has heretofore proved a barrier to thorough
prospecting. The four discoverers of the
\$44,500 bonanza are D. Dunn, who used to
be a contractor at San Francisco, but now
a resident of Los Angeles; C. Hayes, for-
merly head clerk at the Russ House, San
Francisco; C. E. Burk, a former resident of
Yuma, and later an active prospector and
worker of mines at the Laguna and else-
where, and Col. S. A. Buckingham, who tells
us he took out the Seventh New York Volun-
teers (not the Seventh New York Militia) in
1861. Col. Buckingham came to California
about a year ago, and to Arizona nearly two
months ago. Since that time he has been
examining mines in Pinal county, and has
bonded eight which he hopes to dispose of
in San Francisco.

South American Trade.

A correspondent writes as follows to the
N. Y. Times:

There appeared lately in some of our daily
papers short extracts of a communication
to our State Department on topics touching
our commercial relations with South Amer-
ica, to which our great Centennial Exhibi-
tion in 1876 had given a new impulse, and
drawing at the same time the attention of
our Spanish American neighbors to us and
our manufacturers, while it stimulated a re-
markably warm desire on our part to fully
open to us the boundless markets of our own
continent of nations from whom we draw
immense supplies, products exclusively of
their soil, paying them back in our precious
metals for much the larger amount, while
European countries actually clothe them,
feed them, and supply their wants and luxu-
ries. Germany, England, and France have
done this for many a decade, by sail, ere
steam came into use, and by numerous
steam craft since monopolizing even their
coasting trade—in fact, the shores of our
own continent; but this has been the wise
policy of European governments, compared
to a pecuniary system as mapped by ours.
England, Germany and France have not
only opened a gulf that swallowed up all the
over-produce of their mills and factories, but
also carried back in their hulls the exchanged
treasures that enriched their merchants and
traders, while we stood listlessly and care-
lessly by, seeing the caravans of foreign na-
tions carry these harvests from our own con-
tinent away from our shores, past our very
windows.

It is a well-known fact that our South
American neighbors never were—are not
now—manufacturers or producers, and will
not be for some long time to come; and
the lively exertions lately put forth on our
part to win their trade will, with a little per-
severance, gradually accomplish this desirable
result, not only by the invincible basis
of superior and much cheaper goods, but
also by opening their eyes to the whole-
some profits which they have heretofore
been wont or were compelled to pay to
Europe for inferior goods, under a faint
inducement of four or even six months'
credit, and a charge of apparently only
2½ per cent. commission to serve as a
pious cover for supposed honest dealing.

No merchant the wide world over who
trades over the seas or to foreign lands
many thousands of miles away, could or
would transact such a business on 2½ per
cent. commission, all else being on the
basis of integrity. We Americans, to whom
this field is new, who will not only give them
better and cheaper goods but also honest
prices, are not expected to emulate the pre-
cepts of Europe by taking profits equaling
nearly 100 per cent. interest on the capital
invested, and to try to smooth it over with a
pious wrapper of only 2½ per cent. com-
mission. We intend to be honestly paid for
honest labor—that is, we feel ourselves en-
titled to a remuneration of 5 per cent.,
which, if the buyer is dealt with honestly,
is nothing but reasonable, and probably will
find little objection else than from our ho-
norable Minister Williams, as Guatemala,
who, while trying to instruct us on that
score, has remained totally silent or failed
to instruct our South American merchants
on any of the salient points which tell in
our favor. He also told them or admon-
ished us that we are mere pupils in the art
of packing our goods, for which we ought
to be thankful to him; but we promise to
accomplish success in that direction as rap-
idly as we succeeded in driving European
manufacturers, in many important branches,
not only out of the United States markets,
but to so completely turn the scales as to
compel our whilom "sellers" to become our
"buyers" in many important items of the
world's necessities, and by the same means
of honest dealing and with the same per-
severance will we conquer the markets of
our South American Continent, and we
are known not to fail in what we under-
take.

The world will soon measure its time by
the standard of American watches and
chronometers and eat its meals with Amer-
ican knives and forks, because our watches
are more reliable and our cutlery more
pleasing to the eye and the purse alike; but
we intend to be fairly remunerated for our
labor and to see our commission merchants
paid the full commission due to them.

The contractors of the Madeira and Ma-
more Railroad, to which the Metropolis was
carrying supplies when she was wrecked off
Kitty Hawk life saving station, applied some
time ago to the Brazilian Minister in Wash-
ington for permission to employ several thou-
sand United States black navvies on the pro-
posed railroad; but the Minister withheld
consent on the ground that he doubted the
legality of introducing free blacks into Brazil.
The Brazilian government, however, sent a
dispatch recently to the Minister, saying
that no objection is to be made to the im-
portation of American citizens in Brazil, no mat-
ter what their color may be. The contrac-
tors are therefore to hire a number of black
navvies soon. It is expected that they will
stand the climate better than the whites.



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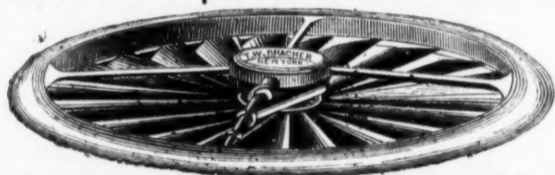
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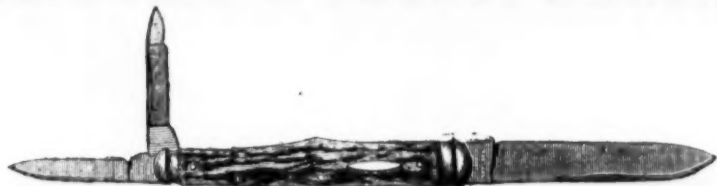
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Every File warranted.

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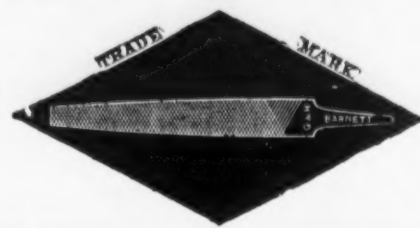
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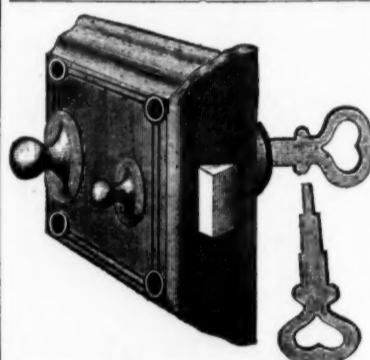
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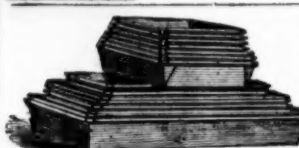
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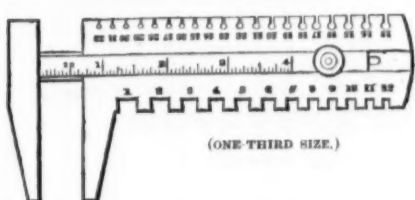
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Illustrated Catalogue sent per mail on application.

British Iron and Steel Institute.

Mr. C. H. Halcott, of Sheffield, read the following paper

ON RAILWAY JOINTS.

If we go back in the world's history about half a century, we shall find the railway system in its early infancy, and engineers devising a railway track, in the hope that they would pass carriages over it at a pace say of 15 or 20 miles an hour. What sort of a foundation would first occur to the mind of an engineer as the proper one for the track? The answer to this question is solidly. He would devise, by the best means in his power, a solid foundation upon which to place his iron rails, and stone would at once come to his aid. Now let us push on the history of the world till we have got to the year 1878, and what a marvelous advance has been made in the science of locomotion! Step by step with the progress of railway speed has taken place the movement of the engineer from the idea of solidity to that of tight-rope elasticity; and I believe I am right in saying that the thing which an engineer at the present time most desires is a tight rope suspended from John-o-Groat's to Land's End. These 50 years of railway life have produced considerable success toward the attainment of this tight-rope principle. Railway sleepers, instead of running longitudinally with the rails, are now laid transversely. Stone beds are a thing of the past; and probably it is not too much to say that every difficulty has been overcome save one, namely, the connection of the rails with each other so as practically to make them one. The engineering mind has been directed to the solution of this problem for many years past, and when the fish-plate was introduced success seemed to have been attained in a high degree; but since the birth of the fish-plate the pace of the railway engineer has increased, and with that pace has come such an irritation upon the best devised fish-plate that its life at best is of short duration.

Let us look for a moment at one of the best of the fish-plates. It can only be connected to two rails by means of four holes, four bolts and four nuts. Now view one of our modern railway engines followed by two or three Pullman cars, and let the pace be 50 miles an hour. Watch the effect upon the fish-plate. The pressure is immense upon the four bolt holes. The best of iron and the best of steel can only resist for a time; friction takes place, and the effect of the friction is intensified by every train that passes over the rails, until, ultimately, there is such an amount of wear and tear in bolts, holes and fish-plates that they have to be entirely renewed. During the short life of this model fish-plate it has had daily nursing; the nuts must be constantly watched, and the watchman must have with him the means to screw up the fish-plate and keep it in condition.

I have said nothing as to the chairs in which the rails are seated, or of the plugs or bolts by which these chairs are fastened to the sleepers; but in passing I may just remark that, although the first effect of what I call the irritation of an express train is developed in the bolt-holes and bolts of the fish-plate, the secondary symptoms are also developed on the bolts and plugs which connect the railway chair to the sleeper; and any one who has seen a sleeper stripped after a few years' work will know how irritating the bolts have all worked to produce looseness, destruction and decay.

In a mile of single track railway, the rails being 24 feet in length, there are 1760 bolt-holes in the rails, 1760 bolts for the fish-plates, 1760 nuts, 14,080 bolts and plugs for the chairs. These constitute an army of little imps, whose set purpose it is to create all the mischief possible, and upset, if they can, trains carrying the most precious freights. This leads me now to speak of an invention, the result of which I hope will be comparative destruction of the imps aforesaid, and therefore greater safety to Her Majesty and all her loyal subjects.

The Acaster rail joint—what is it? It is an application of the simple mechanical principle of the wedge, and its perfection (excuse the term) arises from its simplicity. It consists of two wedges with roughened edges, grooves being cut in the foot and under the head of the rail. It is easy to drive in the two wedges, their roughened surfaces being in contact with each other, their smooth surfaces in contact with the head and foot of the rail. The joint is 18 inches long, reaching, therefore, 9 inches on each rail; the taper is 3/4 inch in the 18 inches; the rails are grooved for 10 1/2 inches at each end, so that it is impossible, on the steepest incline, for the rails to be drawn out of the joint. I have myself watched the effect for the last eight months upon the Midland Railway, and have found that the joints put down there in August last now remain exactly as first put down, so that I may say there has not been the slightest movement of the parts *inter se*. The test of these eight months really means in my view that the joint is so perfect that it makes the rails into one solid whole, while at the same time the rails have power to expand or contract without in any degree loosening the joint.

I summarize my paper under the six following heads:

1. No nuts and bolts to screw up.
2. No wear and tear from friction.
3. An elastic, continuous, smooth-running surface is obtained.
4. The joint is made of steel, and can be made as strong, durable and elastic as the rail.
5. Saving in cost when maintenance and wear and tear are taken into account.
6. No necessity for the sleepers being placed nearer together at the joints than in the center of the rail.

In conclusion, I beg to be allowed to say that after having given many months of thought to the joint which I have introduced to your notice, I assure you its value has grown upon me day by day; and in addition to the comfort which will be introduced in traveling by doing away with those little bumps which, on the best of lines, tell us when we pass from one rail to another, there will result, I hope, greater safety to the railway traveling community, which may nowadays be said to be everybody.

An interesting paper was read by Mr. Charles Wood, on

STATISTICS RESPECTING THE PRODUCTION AND DEPRECIATION OF RAILS.

The length of railway lines opened in the entire world in 1850 was 18,000 miles; in 1860, 63,600 miles; in 1870, 127,000 miles; and in 1875, 176,400 miles. We thus see that during the last-mentioned period the increase has been at the rate of 10,000 miles per annum. If we take the same rate of increase from that date we find at the beginning of 1878 the mileage will be 206,000 miles, 17,000 miles of which are in the United Kingdom alone. I have dealt with these separately, because they are mostly double lines, and laid with heavy rails.

Miles.	
Total mileage of the world.....	206,000
Deduct for the United Kingdom.....	17,000
.....	189,000

To which add for sidings, stations and double lines about 25 per cent.....
.....	49,000

Total miles outside the United Kingdom..... 238,000

The 17,000 miles of railway in the United Kingdom are taken as being double. Many are, I admit, single lines, but there are others having four lines, which, with the additions for stations and sidings, it is estimated will bring up the total to that of a double line throughout, or equal to about 34,000 miles of single road. Collieries, mines and private lines make also an addition of 12 1/2 per cent. more. And if we take the average weight of the rails at 118 tons per mile, we find the total weight of rails to be about 4,500,000 tons now in use in the United Kingdom.

Taking the 238,000 miles above quoted at 108 tons per mile we get the total tonnage of rails in the world as under:

Tons.	
Outside the United Kingdom.....	25,704,000
Within the United Kingdom.....	4,500,000
Total.....	30,204,000

The average life of a rail is calculated at ten years.

We require then for replacement each year.....	Tons.
.....	3,020,400
For the 10,000 miles of new railway laid down each year, as before shown, at 108 tons per mile.....	1,080,000
For private lines, mines, collieries.....	100,000
Total annual requirements.....	4,110,400

The make of iron and steel rails in all countries, as far as I have been able to ascertain, is as follows:

Tons.	
United States of America.....	870,000
Belgium.....	300,000
Great Britain, exports.....	586,000
..... for replacement.....	450,000
..... for new railways.....	30,000
All other countries.....	500,000
Total annual make.....	2,745,000

I have shown, then, that the real healthy demand under ordinary conditions ought to be something like 4,110,000 tons per annum; and that the total make of rails in all countries is only about 2,745,000 tons per annum. There is, therefore, a deficiency in the demand, or, in other words, orders are kept back equal to 1,365,000 tons per annum.

I have endeavored in the foregoing figures rather to underestimate than otherwise, but should they in the main be correct, it shows this very important and very interesting fact, that orders are not coming forward as they should do, chiefly, I suppose, because during times of depression railway companies withhold renewals as much and as long as possible, and, consequently, sooner or later there must be a general rush into the market. This being the case, it is evidently the true policy of every railway company to purchase while rails can be had at a favorable price. The obvious result from such a course would be that trade would be stimulated during a universal depression, and would relieve the demand, with all its evil consequences, when the rush comes.

Mr. Wood then at length examines the various systems of iron sleepers for permanent ways, comparing them with wooden ones. He points out that in England the substitution of iron for wood will open a large market to iron manufacturers.

Probable Applications of the Phonograph.

Thomas A. Edison, the famous inventor of the phonograph, recently contributed to the *North American Review* an interesting account of the probable applications of the phonograph, which, as their realization requires the exercise of mechanical ingenuity, will command the attention which the great number of conjectural and prophetic opinions of enthusiasts threatened to usurp. Among the more important applications which Mr. Edison classes under "probabilities" the following may be mentioned: Letter-writing and other forms of dictation, books, education, reader, music, family record; and such electrotype applications as books, musical boxes, toys, clocks, advertising and signaling apparatus, speeches, &c. The inventor is now perfecting an apparatus in mechanical detail which is to become the standard phonograph, and which may be used for all purposes except such as require special form of matrix, such as toys, clocks, &c., for an indefinite repetition of the same thing. The main utility of the phonograph, however, being for the purpose of letter-writing and other forms of dictation, the design is made with a view to its utility for that purpose.

The general principles of construction are a flat plate or disk, with spiral groove on the face, operated by clock work underneath the plate; the grooves are cut very closely together, so as to give a great total length to each inch of surface—a close calculation gives as the capacity of each sheet of foil upon which the record is had in the neighborhood of 40,000 words. The sheets being only 10 inches square, the cost is so trifling that but 100 words might be put upon a single sheet without unduly increasing the expense. Still, it is problematical whether a less number of grooves per inch might not be the better plan—it certainly would for letters—but it is desirable to have only one class of machines throughout the world, and as very extended communications, if put upon one sheet, could be transported more economically than upon two, it is important that each sheet be given as great capacity as possible. The writer has not yet decided this point, but will experiment with a view of ascertaining the best mean capacity.

The practical application of this form of

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1, .19	8, .29	15, .58	18, .94	11, .62	18, 1.46	22, 3.33	2, .59	5, .67	10, 1.15	14, 2.42	20, 5.56	13, 3.13	14, 3.54
2, .19	9, .31	16, .65	20, 1.17	12, .71	20, 1.69	24, 3.69	3, .59	6, .71	11, 1.29	15, 2.75	22, 7.00	14, 3.54	15, 3.93
	10, .33			13, .79	22, 2.10	26, 4.05	4, .61	7, .76	12, 1.45	16, 3.10	24, 8.00	15, 3.93	16, 4.30
	11, .35			14, .88	24, 2.60		5, .64	8, .82	13, 1.63	17, 3.50		16, 4.30	17, 4.70
	12, .37			15, .97			6, .68	9, .90	14, 1.83	18, 4.00		17, 4.70	18, 5.20
				16, 1.06			7, .74	10, .99	15, 2.05	20, 5.20		18, 5.20	19, 5.56
				17, 1.17				11, 1.09	16, 2.35			19, 5.56	20, 5.92
				18, 1.26				12, 1.20	17, 2.75			20, 5.92	21, 6.28
				19, 1.46				13, 1.35				21, 6.28	22, 6.64
				20, 1.69				14, 1.55				22, 6.64	23, 7.00
				22, 2.25				15, 1.80				23, 7.00	24, 7.36
								16, 2.10				24, 7.36	25, 7.72
												25, 7.72	26, 8.08
												26, 8.08	27, 8.44
												27, 8.44	28, 8.80
												28, 8.80	29, 9.16
												29, 9.16	30, 9.52
												30, 9.52	31, 9.88
												31, 9.88	32, 10.24
												32, 10.24	33, 10.60
												33, 10.60	34, 10.96
												34, 10.96	35, 11.32
												35, 11.32	36, 11.68
												36, 11.68	37, 12.04
												37, 12.04	38, 12.40
												38, 12.40	39, 12.76
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												40, 13.12	41, 13.48
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												44, 14.56	45, 14.92
												45, 14.92	46, 15.28
												46, 15.28	47, 15.64
												47, 15.64	48, 16.00
												48, 16.00	49, 16.36
												49, 16.36	50, 16.72
												50, 16.72	51, 17.08
												51, 17.08	52, 17.44
												52, 17.44	53, 17.80
												53, 17.80	54, 18.16
												54, 18.16	55, 18.52
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												56, 18.88	57, 19.24
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												58, 19.60	59, 19.96
												59, 19.96	60, 20.32
												60, 20.32	61, 20.68
												61, 20.68	62, 21.04
												62, 21.04	63, 21.40
												63, 21.40	64, 21.76
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												74, 25.36	75, 25.72
												75, 25.72	76, 26.08
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												80, 27.52	81, 27.88
												81, 27.88	82, 28.24
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												83, 28.60	84, 28.96
												84, 28.96	85, 29.32
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												96, 33.28	97, 33.64
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	3,	.55		4,	.57		5,	.61		7,	.70		7,	.73		7,	.78		9,	1.08		9,	1.28
	4,	.58		5,	.60		6,	.64		8,	.76		8,	.80		8,	.87		10,	1.28		10,	1.42
	5,	.60		6,	.63		7,	.69		9,	.84		9,	.88		9,	.97		11,	1.48		11,	1.58
							8,	.75		10,	.92		10,	.98		10,	1.10		12,	1.60		12,	1.78
													11,	1.10		11,	1.25		13,	1.88		13,	1.98
													12,	1.24		12,	1.40		14,	2.08		14,	2.22

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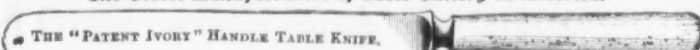
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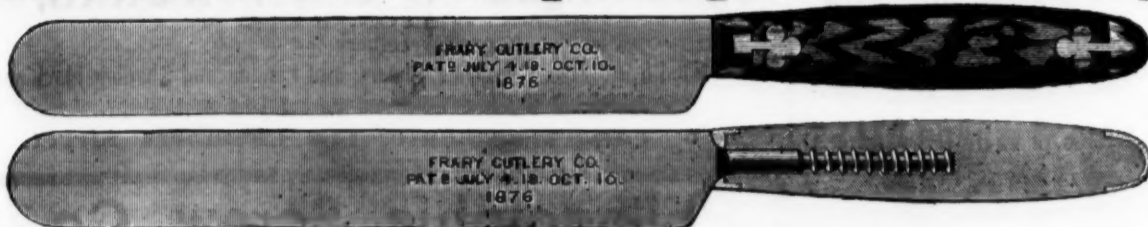
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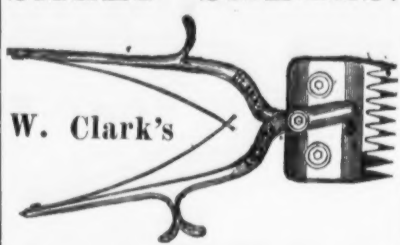
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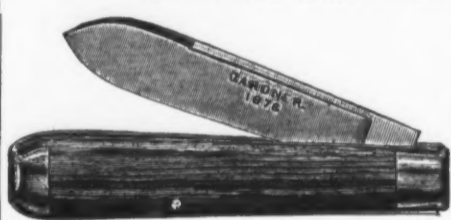
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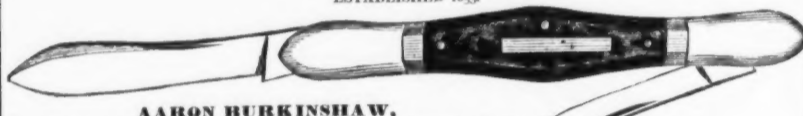
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phonograph for communications is very simple. A sheet of foil is placed in the phonograph, the clockwork set in motion and the matter dictated into the mouthpiece without other effort than when dictating to a stenographer. It is then removed, placed in a suitable form of envelope and sent through the ordinary channels to the correspondent for whom designed. He, placing it upon his phonograph, starts his clockwork and listens to what his correspondent has to say. Inasmuch as it gives the tone of voice of his correspondent it is identified. As it may be filed away as other letters and at any subsequent time reproduced, it is a perfect record. As two sheets of foil have been indented with the same facility as a single sheet, the "writer" may thus keep a duplicate of his communication. As the principal of a business house or his partners now dictate the important business communications to clerks to be written out, they are required to do no more by the phonographic method, and do thereby dispense with the clerk and maintain perfect privacy in their communications.

The phonograph letters may be dictated at home or in the office of a friend, the presence of a stenographer not being required. The dictation may be as rapid as the thoughts can be formed or the lips utter them. The recipient may listen to his letters being read at a rate of from 150 to 200 words per minute, and at the same time busy himself about other matters. Interjections, explanations, emphasis, exclamations, &c., may be thrown into such letters ad libitum.

In quite another direction the phonograph will perfect the telephone and revolutionize present systems of telegraphy. That useful invention is now restricted in its field of operation by reason of the fact that it is a means of communication which leaves no record of its transactions, thus restricting its use to simple conversational chat-chat, and such unimportant details of business as are not considered of sufficient importance to record. Were this different, and our telephone conversation automatically recorded, we should find the reverse of the present status of the telephone. It would be expressly resorted to as a means of perfect record. In writing our agreements we incorporate in the writing the summing up of our understanding—using entirely new and different phraseology from that which we used to express our understanding of the transaction in its discussion, and not infrequently thus begetting perfectly innocent causes of misunderstanding. Now, if the telephone, with the phonograph to record its sayings, were used in the preliminary discussion, we would not only have the full and correct text, but every word of the whole matter capable of throwing light upon the subject. Thus it would seem clear that men would find it more advantageous to actually separate a half mile or so in order to discuss important business matters, than to discuss them verbally, and then make an awkward attempt to clothe their understanding in a new language. The logic which applies to transactions between two individuals in the same office applies with the greater force to two at a distance, who must discuss the matter between them by the telegraph or mail. And this latter case, in turn, is reinforced by the demands of an economy of time and money at every mile of increase of distance between them.

"How can this application be made?" will probably be asked by those unfamiliar with either the telephone or phonograph.

Both these inventions cause a plate or disk to vibrate, and thus produce sound waves in harmony with those of the voice of the speaker. A very simple device may be made by which the one vibrating disk may be made to do duty for both the telephone and the phonograph, thus enabling the speaker to simultaneously transmit and record his message. What system of telegraphy can approach that? A similar combination at the distant end of the wire enables the correspondent, if he is present, to hear it while it is being recorded. Thus we have a mere passage of words for the action, but a complete and durable record of those words as the result of that action. Can economy of time or money go further than to annihilate time and space, and bottle up for posterity the mere utterance of man without other effort on his part than to speak the words?

In order to make this adaptation it is only requisite that the phonograph shall be made slightly more sensitive to record and the telephone very slightly increased in the vibrating force of the receiver, and it is accomplished. Indeed the "Carbon Telephone," invented and perfected by Mr. Edison, will already well nigh effect the record on the phonograph; and as he is constantly improving upon it to cause a more decided vibration of the plate of the receiver, this addition to the telephone may be looked for coincident with the other practical applications of the phonograph, and with almost equal certainty.

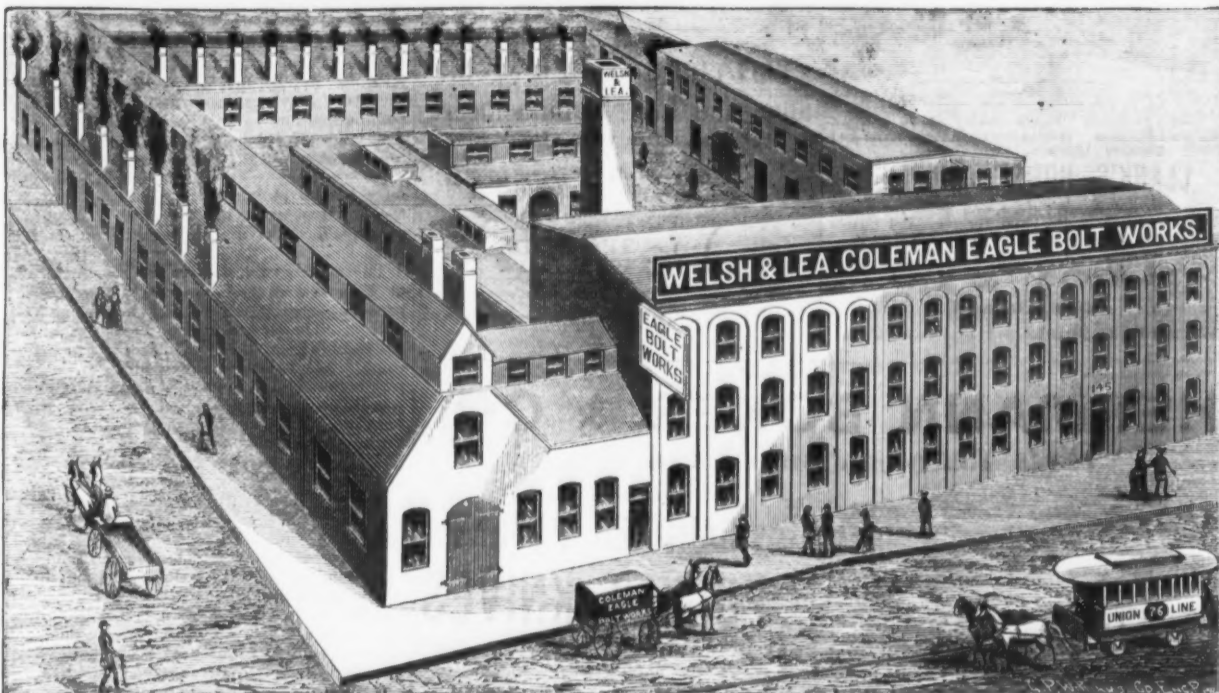
The telegraph company of the future—and that no distant one—will be simply an organization having a huge system of wires, central and sub-central stations, managed by skilled attendants, whose sole duty it will be to keep wires in proper repair and give, by switch or shunt arrangement, proper attention to subscriber No. 923 in New York when he signals his desire to have private communication with subscriber No. 1001 in Boston for three minutes. The minor and totally inconsequent details which seem to arise as obstacles in the eyes of the grooving telegraph man, wedded to existing methods, will wholly disappear before that remorseless Juggernaut, "the needs of man;" for will not the necessities of man surmount trifles in order to reap the full benefit of an invention which practically brings him face to face with whom he will, and, better still, doing the work of a conscientious and infallible scribe?

The Railway Age says: The steady downward tendency of railway freight rates for a number of years is exemplified in the figures kindly sent us by the auditor of the Western Union road, showing that since 1860 the rate per ton per mile on his road has fallen, by almost regular annual gradations from 3.36 cents to 1.72 cents—a decrease of almost 50 per cent. in 9 years.

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ESTABLISHED 1845.

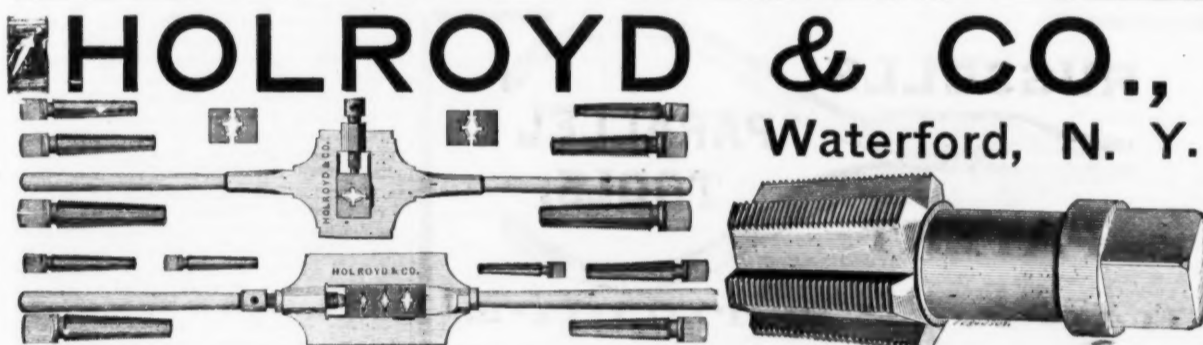
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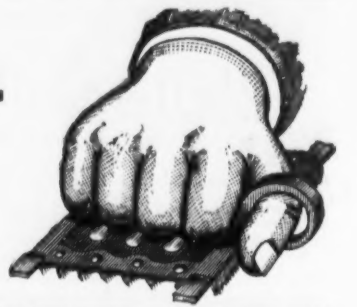
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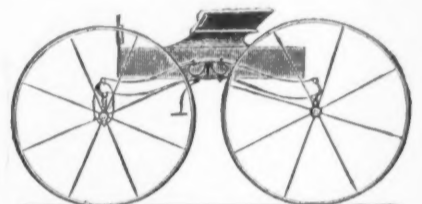
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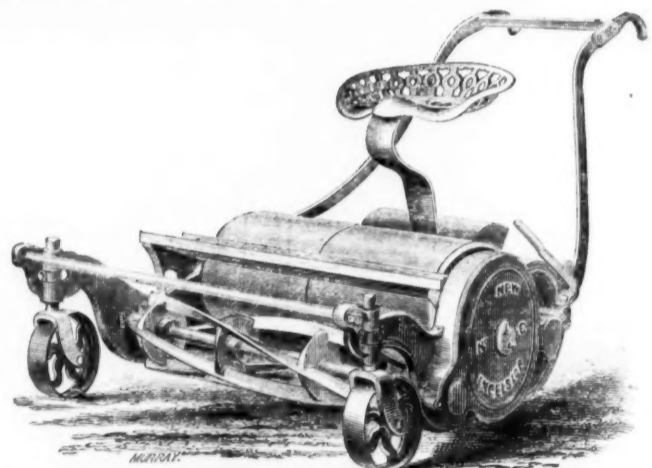
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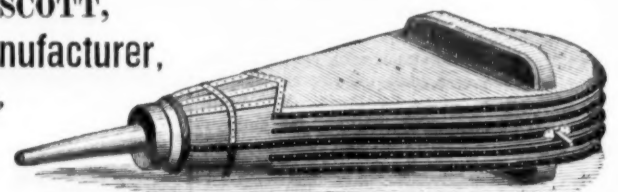
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The Iron Age.

New York, Thursday, May 2, 1878.

DAVID WILLIAMS, Publisher and Proprietor.
JAMES C. BAYLES, Editor.
JOHN S. KING, Business Manager.

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The American Hardware Company, Melbourne, are agents for Australia. Sample copies will be mailed by them, free of charge, to any firm engaged in the trades we represent in Australia, Tasmania and New Zealand.

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Thirty-first Page.—New York Wholesale Prices. (Continued).

Thirty-second Page.—Philadelphia, Buffalo, Chicago and Pittsburgh Hardware and Metal Prices.

Thirty-ninth Page.—Boston and St. Louis Hardware and Metal Prices.

Mr. Joseph D. Weeks, Associate Editor of *The Iron Age* and manager of our Pittsburgh office, sailed yesterday on the Scythia for Liverpool en route for Paris. Mr. Weeks travels in company with several eminent Western iron masters, and will probably visit some of the principal iron districts of Great Britain before crossing the channel. In Paris, Mr. Weeks will manage our bureau of Exhibition correspondence, giving personal attention to the iron and hardware exhibits. He also carries a special commission from Gov. Hartranft, of Pennsylvania, to inquire into the workings of the principle of arbitration in trades disputes in Europe, and to collect information on other important subjects connected with labor and

wages. We wish him a pleasant voyage and a safe return, as we shall miss his valuable aid in representing Western interests in our columns. Mr. Weeks is a gentleman of great force and energy, a conscientious and able journalist, and one of the few men who cannot be away from home and work without being greatly missed.

The Commercial Importance of Austria.

Austria proper, according to the latest census, has a population of 20,394,980, and Hungary 15,417,327, making together 35,812,307, disseminated over an area of 240,381 square miles. The empire is, therefore, in size about midway between the States of Texas and California. Germany, as now constituted, is 30,155 square miles smaller, but exceeds Austria in population by 4,288,722 inhabitants. From a commercial point of view Austria is as important as Germany, although not possessing so large a sea-coast; but the soil of Austria is more fertile, and her mineral resources are, taken as a whole, not inferior to those of Germany, although less developed. Geographically, Austria's interests lean toward the Southeast, following the course of the Danube on the one hand and reaching toward the Adriatic and Mediterranean on the other. Germany has its chief basis between Central Europe and the important northern seas.

Notwithstanding frequent wars during the past 30 years, the loss of her purely Italian provinces, and the financial difficulties with which she has had to cope, Austria has been keeping pace with the moral and material progress of the less heterogeneous nations which make up the rest of civilized Europe. This has been due in a great measure to the good sense and moderation of the present emperor and the wisdom of his advisers, again put to a severe test at the present moment.

The following statistics will show Austria's present position as compared with Europe and the rest of the world:

Merchant Navy, 1877-78.—Austrian Empire: Sailing vessels, 68; tonnage, 253,720; steamers, 74; tonnage, 83,545. Other maritime nations: Sailing vessels, 51,260; tonnage, 14,525,400; steamers, 53,977; tonnage, 5,424,186.

Railroads, 1877-78.—Austrian Empire: miles, 10,046; cost, \$34,377,794. Rest of Europe: miles, 181,271; cost, \$9,296,238,143.

Telegraphs, 1875.—Austrian Empire: Offices, 309; instruments, 2956; operators, 469; area, miles, 372,521; lines, miles, 28,322; wires, miles, 79,802; messages, thousands, 6140, or 343 per thousand inhabitants. Rest of the world: Offices, 26,512; instruments, 43,160; operators, 48,336; area, miles, 9,737,728; lines, miles, 218,468; wires, miles, 558,490; messages, thousands, 78,599.

Post Offices, 1875.—Austrian Empire: Offices, 6087; letters and postal cards per capita of population, 15; newspapers and samples, do., 4.7; proportion of letters to telegrams, 54 to 1. Rest of Europe: Offices, 43,724; letters and postal cards per capita of population, 9.7; newspapers and samples, do., 5.5.

The only one of the four great elements of communication in which Austria compares unfavorably with the rest of Europe is that of her merchant navy. This is owing to the fact that Austria has no port on the Atlantic. After a while, we presume, she will take a more active share in the trade with the extreme East through the Suez Canal, and not allow Italy to remain ahead of her in this respect.

The following shows the magnitude of Austria's traffic with foreign nations in millions of dollars:

	Import.	Export.	Total.
1867.....	147.15	203.70	350.85
1871.....	270.35	233.80	504.15
1872.....	306.85	194.00	500.85
1873.....	291.55	211.80	503.35
1874.....	284.35	224.05	508.40
1875.....	275.25	252.25	527.50
1876.....	267.10	295.30	562.40
1877.....	267.05	338.35	605.40

The volume of trade during the past year, it will be seen, has been increased about 9 per cent. This increase has taken place mainly, we presume, in consequence of the locking up of the Russian grain crop around the Black Sea during the late war. Central Europe and the Mediterranean have thus been compelled to draw their supplies from Austro-Hungary, and the high prices realized have enabled the agricultural classes to consume imported goods in proportionately larger quantities.

Notwithstanding the financial and industrial crisis which began with the so-called "Vienna crash" at the time of the exhibition, it will be seen that the general trade movement in Austria has since developed most satisfactorily. Instead of trying to get rich suddenly on the stock exchange or by the founding of wild-cat banks and building societies based on fictitious real estate values, the industrial and commercial classes in Austro-Hungary have returned to steeper and less problematical pursuits; and although the country has not escaped the bad times which the crash we have alluded to precipitated, the wedding-up process has been long accomplished, and if peace be preserved, the commercial future of Austria is as promising, on the basis of present values, as that of the Western nations. Out of 147 financial concerns founded between 1871 and 1876, 103 have succumbed, and their capital of \$305,000,000 has now shrunk to \$120,500,000, owned by the 43 surviving banks. Referring to Vienna alone, we find that between 1871 and 1873 there were founded in that city 51 new banks. All but seven were wiped out by January 1, 1876, and there now remain but two out of these seven. Between 1871 and 1873 there went into operation 3769 miles of new railroads; between 1874 and 1877 but 1577 miles were opened to public traffic. All of the latter, with the exception of 103 miles, were finished at government expense, the private companies being unable to complete them, since the public has lost confidence in private railroad management.

Our trade with Austria has of late years increased considerably, as the following table will show:

	Our	Domestic	Foreign	Total.
Fiscal years.	Import.	Export.	Export.	
1864.....	223	99	53	375
1865.....	197	107	102	406
1866.....	436	620	23	1,149
1867.....	511	162	30	703
1868.....	628	268	..	896
1869.....	976	623	3	1,599
1870.....	371	1,185	23	1,579
1871.....	944	1,630	24	2,598
1872.....	1,012	1,460	34	2,506
1873.....	981	1,609	61	2,651
1874.....	489	1,682	6	2,177
1875.....	669	1,662	5	2,336
1876.....	950	1,554	1	2,505
1877.....	44	2,666	2	2,712

Grand total..... 8,228 16,227 458 24,913

The following were among the domestic goods shipped from the United States to Austria direct during the fiscal year ended June 30, 1877:

Dye stuffs.....	\$13,687	Lard.....	\$6,438
Leather.....	10,000	Tallow.....	5,308
Leaf tobacco.....	40,595	Other goods.....	536,751
Rosin.....	96,105		
Petroleum.....	1,841,091		
Cotton seed oil.....	67,700		
Bacon & hams.....	14,700		
Total.....			\$3,666,246

It will be seen that petroleum and tobacco constitute our chief exports to Austria. Many American goods of course find their way into Austria through Germany, perhaps as much more, the trip from our Atlantic ports to Trieste being very circuitous, and in the sluggish waters of the Adriatic requiring steam towage. The distance is the great impediment in the way of a direct traffic with Austria, and this distance is considerably shortened via Hamburg, thence by rail to Bohemia, Austria, Silesia and the remaining provinces. Bohemia, Silesia and Western Austria consume large quantities of American cotton, which they order from Liverpool and Bremen. Not a pound of it goes direct to Trieste.

Many American agricultural implements are used in Austria. Mowers and reapers are employed on the vast prairie lands of Hungary, but we doubt whether any of them ever go direct. We are sure that the Austrian and Hungarian visitors at the Paris Exhibition will take a deep practical interest in anything in the way of agricultural machinery, implements and tools we may there exhibit, and large orders may be hoped for.

The Wood Tariff as a Revenue Measure.

Dr. Young, of the Bureau of Statistics, sends us the following table, showing the value of the Wood tariff (House bill No. 4106) as a revenue measure. It is a corrected summary statement, by schedules, of the amount of duty received from the articles enumerated in the Tariff Bill (H. R. No. 4106) which entered into consumption in the United States during the year ended June 30, 1877, and the estimated amount of duty by the proposed bill, with the increase or decrease of each schedule:

Schedule.	Class or Group.	Received in 1877.	Estimated (new rates).	Increase.	Decrease.
1.	Cotton and cotton goods.	\$6,544,810.80	\$6,544,810.80		
2.	Wool and woolen goods.	6,320,500.27	6,320,500.27		
3.	Leather.	6,000,000.00	6,000,000.00		
4.	Iron and steel.	6,000,000.00	6,000,000.00		
5.	Gold and silver.	6,000,000.00	6,000,000.00		
6.	Alcohol.	6,000,000.00	6,000,000.00		
7.	Wine.	6,000,000.00	6,000,000.00		
8.	Oil.	6,000,000.00	6,000,000.00		
9.	Soap.	6,000,000.00	6,000,000.00		
10.	Flour.	6,000,000.00	6,000,000.00		
11.	Wheat.	6,000,000.00	6,000,000.00		
12.	Barley.	6,000,000.00	6,000,000.00		
13.	Oats.	6,000,000.00	6,000,000.00		
14.	Rye.	6,000,000.00	6,000,000.00		
15.	Wheat and flour.	6,000,000.00	6,000,000.00		
16.	Wheat and flour.	6,000,000.00	6,000,000.00		
17.	Wheat and flour.	6,000,000.00	6,000,000.00		
18.	Wheat and flour.	6,000,000.00	6,000,000.00		
19.	Wheat and flour.	6,000,000.00	6,000,000.00		
20.	Wheat and flour.	6,000,000.00	6,000,000.00		

Total duty received in 1877..... \$128,223,007.41

Total duty received in 1877, as above..... 128,223,007.41

Duty not provided for in the bill..... \$3,198,221.09

Duty received as per above schedule..... \$125,024,986.32

Duty estimated..... 121,982,468.11

Decrease of..... \$3,042,517.61

Total decrease from receipts of 1877..... \$6,240,739.30

If the Wood tariff is not a revenue measure, what is it? Probably the only answer to this question is that it is an effort on the part of sundry politicians to make cheap capital through a mistaken estimate of the popular sentiment on the subject of protection. If they could show a net saving in taxation by an increased revenue from imports, there would be some method in their madness, but when they gravely propose to reduce the customs revenues and make good the deficiency by a reimposition of the most burdensome and objectionable of all ways of raising money—the tax on incomes—they show that while aspiring to be statesmen they are not even good politicians.

Boston is to have an industrial exhibition this fall under the auspices of the Charitable Mechanics' Association. The location will

*The duty on sugars has been computed at an average of 2.76 cents per pound, in accordance with the estimate of experts.

be the lots of land on Park square, belonging to the city of Boston and the Boston and Providence Railroad, aggregating about 85,000 square feet, which have been tendered the association rent free. They will also have the contiguous Tennyson street school house at the bare expense of the removal of the schools. All this will give double the ground room ever before used for the exhibition. It is estimated that the necessary buildings on the vacant site can be erected for about \$30,000. The exhibition will open early in September, although the precise day has not been fixed. The fine location and large area on the first floor guarantee an exhibition in dimensions and importance such as has never before been equaled in the history of the society.

Socialist Disturbances.

A great deal of unnecessary alarm has been created by the announcement that the communists and socialists of various cities are arming and drilling. One of these agitators in Chicago informs a newspaper reporter that they intend to try the merit of the constitutional provision of the United States which guarantees to every citizen the right to keep and bear arms. "At our mass meetings this summer," he says, "we shall carry arms with us, and if armed assassins and paid murderers employed by the capitalistic class undertake to disperse and break up our meetings, as they did in such an outrageous manner last summer, they will meet foes worthy of their steel." "In other words, you don't propose to use arms until the other side become the aggressors?" "We don't propose to use arms unless they interfere with us and try to break up our meetings. But as to their being the aggressors, why that's what the capitalists always are. They are always treating the working classes with violence. Isn't starvation wages violence? Isn't trampism violence? Isn't depriving men by the hundred thousand of the right to live and support their families violence, and violence of the most infamous character? We simply resist. We protect ourselves. That's all."

There is much in this kind of talk calculated to frighten nervous old ladies, but very little to occasion any serious alarm among men who have any capacity for reflection. We have no doubt that in some of our larger cities the socialistic element is strong enough to create occasional local disturbances, but the organized power of law and order will have but little difficulty in suppressing such manifestations of revolutionary spirit. Something over a year ago there was an attempt in this city to create a disturbance, and thousands of idle and vicious men gathered in Tompkins Square bent upon mischief. Any leniency or sign of weakness on the part of our authorities would have been fatal; as it was, the crowd dispersed peaceably, and the leaders betook themselves to neighboring wine cellars and beer saloons to boast of what they were going to do when they could.

These men who call themselves "citizens" and take the red flag as their banner are scarcely worth the serious consideration of the student of social science. They have nothing to propose which is practicable this side of Arcadia or heaven; they do not, and never will, enjoy the sympathy and support of the American working classes; and they are vastly more given to loud talk and empty boast than to secret and powerful conspiracy. They are a class of men whom the police can watch with advantage, but they can do nothing which will be worse than was done last year in Pittsburgh and other railroad centers. This may be bad enough, it is true, but if there had been any material existing for a revolutionary movement, it would have been a great deal worse. A few such men as "Citizen" Schwab, "Citizen" Megy, "Citizen" Kerney and "Citizen" Parsons can make a great deal of noise, but it is like the noise of sounding brass, and their favorite method of warfare is the traditional Chinese method of advancing with gongs. To hear one of these "citizens" plead for liberty in a police court when called up to answer the charge of "drunk and disorderly," would convince the most timid that they are not of the stuff heroes and martyrs are made of.

Victor Hugo's grand conception of Jean Valjean, is realized in some respects in the Ohio man who, after rising to an honorable prominence, is discovered to be an ex-convict. On the 27th ult. Hon. John O'Connor, a prominent member of the Ohio Legislature and chairman of an important committee, rose to a question of privilege. For some time proof has been accumulating that he was a deserter, a bounty jumper, and an ex-convict of the Michigan State Prison. Several times he has endeavored to resign, but the speaker refused to lay his resignation before the House until Thursday, when it was voted to investigate his record. His speech on that day was in the nature of a confession of all that had been alleged. He said he had struggled for 10 years to elevate himself to a position and make himself worthy of the esteem of honest men; but all his efforts had gone for naught, and an attempt was now being made to drive him into the gutter. He denied the right of the House to investigate his history previous to his becoming a citizen of the United States. If such investigation should prove that his conduct in the past had not been proper, it could do no one any good and would crush him forever. He threw himself on the generosity of the House, trusting that in their magna-

nimity they would not further pursue a man who was crippled in body and poor in purse. At the close of his speech he sank pale and trembling in his chair, and tears rolled down his face. He then left the House to await its action. This case, which cannot fail to excite the sympathy of every right-thinking man, has a practical bearing upon the question of the duty of the State toward convicts, which has lately been the subject of much discussion among manufacturers. It is admitted that the industrial education of convicts is the surest way of reforming them; but if they are still to be convicts and outcasts, despite their reformation, they have but little inducement to forsake evil ways and seek a place among honorable men. The spectacle of a man rising from such moral degradation to a position of trust among honest men, is one of the grandest imaginable, and it is the part of true philanthropy to judge such men by what they are and strive to be, rather than by what they have been.

Erie.

The reorganization of the Erie Railroad—or, as it is now known, the New York, Lake Erie and Western Railroad Company—is an event of great importance, and one in which many of our readers are much interested. The sale reported in our last issue was confirmed by the courts on Thursday, and on Friday the property was transferred to the trustees. On Saturday a meeting of directors was held, at which the following gentlemen were present: R. Suydam Grant, Solomon S. Guthrie, Hugh J. Jewett, John Taylor Johnston, Edwin D. Morgan, Cortlandt Parker, Homer Ramsdell, Samuel Sloan, Henry G. Stebbins, George F. Talman, J. Lowber Welsh, David A. Wells, William Walter Phelps, Charles A. Dana, J. Frederick Pierson, Theron R. Butler and James J. Goodwin. Of the absentees, Hermann R. Baltzer is in Europe; John B. Brown is in Portland, Me.; Thomas Dickson and Asa Packer are at the homes of their respective companies; Giles W. Hotchkiss is at Elmira, and Marshall O. Roberts could not be found. All these gentlemen are named in the new articles of incorporation, together with the following members of the English Reconstruction Committee: Sir Edward William Watkin, M. P.; Oliver Gourlay Miller, Henry Rawson, John Kynaston Cross, M. P.; John Westlake, Q. C.; Peter McLagan, M. P.; Benjamin Whitworth, M. P., and Thomas Wilde Powell. Hugh J. Jewett was formally chosen president of the new company and A. R. McDonough secretary. A. S. Spencer, for many years assistant treasurer of the road, was named for treasurer, but action in regard to that office, as also in regard to the position of vice-president and other officials, was postponed until a subsequent meeting, to be held on Wednesday or Thursday next. Shipman, Barlow, Larocque and McFarland were continued as counsel to the corporation. The benefits of the new organization remain open to all parties interested in the property who choose to unite in it. Nearly all the bondholders and a majority of the stockholders have already signified their adhesion. Those stockholders who are still out have yet six months in which to come in, the terms being the payment of 4 per cent. in money on the preferred stock and 6 per cent. on the common. As stated last week the scheme of reorganization embraces a change of gauge to 4 feet 8½ inches and an entire new equipment. The details of the plan have not yet been made public, but as soon as possible we will lay them before our readers.

Both Russian and British local agents remain quiet, apparently waiting for a turn in events. But within a few days a considerable Russian order for metal used in the manufacture of cartridges has been closed. Of still more importance are the orders given by the British government for Gatling guns, the evident determination of the Admiralty being to provide every man-of-war in the British navy with from two to eight of these destructive war engines, chiefly for use in "the tops," so as to rake the decks of an antagonist. At the same time the fortresses in India are being similarly equipped; 200 Gatling guns have recently been ordered for this purpose, and conditionally 200 more. The agents of the manufacturers, in a conversation with us, speak of the recent affair between the Peruvian rebel ironclad Huascar and the British man-of-war sent in pursuit as having brought about this change in naval armaments.

Two steam launches provided with twin screws, and ordered by the Spanish government for service against the rebels in the east end of Cuba, are about being forwarded to their destination from the Delamater Iron Works. They are 45 feet in length, very swift, and capable of turning on their own centers, so that they can, if desired, run into creeks or among the reefs, and thread the most tortuous channels. They cost together about \$10,000, and have engines which are said to be "as handsome as a watch." If we mistake not these are of the West 6-cylinder pattern, and similar to those illustrated in *The Iron Age* of February 21. It is probable these vessels will be sent South via Philadelphia, and from the Southern coast to Cuba direct.

An article in another page on coal washing in Alabama, taken from the *Nashville American*, shows that our friends of the South are beginning to appreciate fully the

importance of preparing coal for the manufacture of a superior quality of coke. The Eureka Company have made arrangements to supply the Oxmore Furnace with washed coke, using one of Stutz's washers.

We are sorry so few of our stove manufacturers realized the importance of the Paris Exhibition in time to secure space for exhibits. We believe that only three of our stove-founding concerns exhibit at all—Rathbone, Sard & Co., of Albany; Abendroth Bros., New York; and the Open Stove Ventilating Co., also of New York. Messrs. Rathbone, Sard & Co. send specimens of their "Delmonico" and "Rathbone" ranges, "Prize Medal" cook, "Novelty" cook, "Dauntless" base burner and "Saturn" parlor heater, all adapted to burning bituminous coal and fitted with all the latest improvements. The exhibit consists of eight stoves and ranges, representing the best work of this house, and including the kinds for which there is already some foreign demand. From their success in the soft coal districts of the West, the firm expect to turn their experience to good account in meeting the conditions existing in Europe.

The exhibit of Abendroth Bros. is quite large. It consists of 44 stoves of all kinds, and is described by them as a general line. This firm have done a considerable export business for several years, and are well satisfied of the advantages to follow their Paris exhibit.

The Open Stove Ventilating Co. made a late application, and only secured space for one stove. As it combines the advantages of stove and open fire, it will probably attract favorable attention.

The sudden change of sentiment in the Senate on the subject of repealing the bankrupt law has occasioned much surprise. The bill on its original passage went through with only a nominal opposition; when returned for concurrence in the House amendments it was supposed it would again pass without much opposition. On Tuesday, however, the vote on a motion to take up the bill for consideration resulted in a tie. It is still probable, however, that those who favor repeal have a majority.

The proposition of the House Sub-Committee on Education and Labor, to offer a bill imposing a tax of \$100 per head on Chinese immigrants, is simply a piece of cheap demagoguery. The issue of the Chinese question promises to be a burning disgrace to the American people, and we hope Congress will not make itself responsible for any part of this by legalizing the persecution of Chinese immigrants.

Yesterday the Paris Exposition was formally opened, but from all the accounts which reach us it will probably be a month before everything will be in place and the show appear to best advantage. We shall have full and valuable correspondence on all matters of interest to our readers.

New Publications.

INDUSTRIAL CHEMISTRY. Edited by B. H. Paul, Ph. D. John Wiley & Sons, New York, 1878.

Every manufacturer engaged in the development of some branch of industry at times finds it necessary to study, if only superficially, the principles of another branch of art or science, either in order to be able to trace the mode of manufacture of the raw material he uses, or to follow the articles he markets in their application to various ends. A correct appreciation of the difficulties or of the wants of others may suggest to him the means of better adapting his mode of manufacture to the resources at his disposal, or to extend the range of application of his manufactures. To him as well as to the student in technical colleges the work under review will be welcome addition to English technical literature. It is based upon a translation of Stohmann and Engler's German edition of Payen's "Precis de Chimie Industrielle." The mass of material which comes within the scope of a work the smallest chapters of which for the specialist would expand into volumes, is arranged very conveniently under the most important elements. Their history, occurrence, characters and preparation, uses and compounds are given, together with a generally concise and fully illustrated description of their modes of manufacture. Thus, for example, under carbon we find a clear, short statement of the element in its different forms of utility as coke, vegetable and animal charcoal, and lampblack. The treatise on carbon closes with a summary of the most important points on fuel. The manufacture of gunpowder is added to potassium, that of glass and potteryware to aluminum, while a short treatise on the metallurgy of each metal is accompanied by a description of the mode of manufacture of those of its compounds for which commerce makes an extensive demand. The specialist must of course not look for information regarding the latest approved mechanical appliances or modifications of detail in processes. These come within the province of the technical journal, supplemented by private enterprise. But for a good exposition of fundamental chemical principles and a general outline of the plant employed, Dr. Paul's "Industrial Chemistry" will fully meet the wants of those who require a good book of reference or a guide in the study of chemical technology. A part of the work is devoted to organic chemistry. For example, the preparation of wood, paper making, fat and oil, the preparation of fatty acids, the purification of tallow and the rectification of crude oil, are given a full share of elaboration. Artificial lighting, the manufacture and treatment of caoutchouc, gutta serena, starch and sugar are discussed as well from the point of view of a practical manufacturer as from that of a chemist. A decided advantage gained by the author is the adoption of the new chemical formulae, which has

of late come into universal use. We have not yet seen the complete work, nor are we able to speak of the thoroughness of the indexing. Of these we shall speak more fully in a future issue; but from what we have seen we are satisfied that the work is as practical and valuable an encyclopedia of arts and sciences as we have ever seen.

The Paris Exhibition.

The Paris Exposition was opened yesterday with great success, the programme for the event, heretofore made public, being strictly carried out. At one time in the morning it was feared that the ceremonies would be interfered with, as at 9 o'clock rain was falling. But at 9.45 o'clock the rain ceased and the day became fine. The clouds broke and the sun shone out brilliantly. The weather was rather hot.

President MacMahon reached the Exhibition at 2 o'clock in the state carriage, escorted by his military household. He was welcomed by M. Teisserenc de Bort, Minister of Commerce, and declared the Exhibition open amid salvos of artillery and music by bands. The Marshal then, at the head of a brilliant procession, which included the Prince of Wales, Ex-King Amadeus and the Crown Prince of Denmark and the Netherlands, proceeded through the Exhibition buildings. The scene was extremely picturesque and imposing. The state bodies in grand uniform, the councillors and magistrates in their robes, and the different bodies of the Institute and the Legion of Honor stood out in strong contrast with the senators, deputies and clergy and minor officers in their civil costumes. The Exhibition building was gaily decorated with the flags of all nations, and an immense crowd was in the neighborhood.

The American section, though unfinished, compares favorably with the others. The department of manufactures shows the least progress. In our trade report will be found a special dispatch to *The Iron Age*, stating which of the American exhibits of hardware and metal goods were ready at the opening.

The French Tariff.

*Import duties on goods arriving direct from non-European countries:

All ores and oxides, free; pig iron, 100 kilos., 96c. to \$1.68; bar iron, flat, 100 kilos., \$2.40 to \$3.36; ditto, square, 100 kilos., \$2.40 to \$3.36; ditto, round, 100 kilos., \$2.88 to \$3.36; sheet iron, 100 kilos., \$4.80; tin plates, 100 kilos., \$9.60; iron wire, 100 kilos., \$7.20; steel, bar, 100 kilos., \$7.20; ditto, rolled, according to diameter, 100 kilos., \$18 to \$26.40; ditto, polished, 100 kilos., \$120; ditto wire, 100 kilos., \$16.80; old iron, 100 kilos., 96c. to \$1.02; dross, 100 kilos., 10c.; copper, ingot or wrought, 100 kilos., \$3; ditto wire, 100 kilos., \$20 to \$24; brass and phosphor-bronze, raw, free; ditto, wrought, 100 kilos., \$3; ditto wire, 100 kilos., \$20 to \$24; copper, gilt or silver-plated, 100 kilos., \$20; pig lead, free; lead, with an alloy of antimony, 100 kilos., \$6.24; sheet lead, 100 kilos., \$5.76; old lead, free; block tin, free; tin in sheets, 100 kilos., \$14.40; old tin, free; spelter, in slabs, free; sheet zinc, 100 kilos., \$12; old spelter, free; nickel, first fusion, whether pure or with alloys, free; ditto, with alloys, manufactured, 100 kilos., \$24; sulphate of antimony, 100 kilos., 24c.; metallic antimony, 100 kilos., \$6.24; cobalt, powder, 100 kilos., \$7.20; cadmium, 100 kilos., 48c.; quicksilver, 100 kilos., 24c.; gold, platinum and silver in bars, as well as old jewelry, 100 kilos., \$2; gold, beaten, 100 kilos., \$500; silver, 100 kilos., \$100; gold and silver, drawn, 100 kilos., \$100; manganese and all other metals, free; clocks and clock movements, per piece, 26c. to \$1.20; type, 100 kilos., \$1.20 to \$4.80; steam engines, stationary, 100 kilos., \$6; ditto, marine, 100 kilos., \$8.40; locomotives without tenders, 100 kilos., \$9.60; iron tenders, 100 kilos., \$7.20; copper ditto, 100 kilos., \$14.40; carding machinery, 100 kilos., \$3.60 to \$14.40; trucks for sand, 100 kilos., \$4.80; iron boilers, 100 kilos., \$7.20; ditto boats, 100 kilos., \$7.20; gasometer copper, 100 kilos., \$14.40; apparatus for sugar boiling, distilling and heating, 100 kilos., \$14.40; all other machinery, 100 kilos., \$4.80 to \$15.60; all other accessories to machinery, 100 kilos., \$4.80; agricultural machinery, plain, of iron and steel, 100 kilos., \$3.60; other, ditto, in iron, steel and copper, \$3.60 to \$4.80; scientific instruments, 12 to 36 per cent.; tools, 100 kilos., \$12 to \$48; wire cloth, 100 kilos., \$18 to \$36; sewing needles, 100 kilos., \$120 to \$192; fish hooks, 100 kilos., \$48; metallic pens, \$6; cutlery, prohibited; all cast iron manufactures, prohibited; iron tube, 100 kilos., \$8.40 to \$12; copper and brass manufactures, 100 kilos., \$24 to \$48; lead ditto \$5.76; tin hollow-ware, \$24 to \$48; manufactures of pure spelter and nickel, prohibited; ditto gilt and plated, prohibited; all arms for war purposes, prohibited; all arms for peaceful purposes, 100 kilos., \$48 to \$96; all powder, percussion caps and projectiles for war, prohibited; all percussion caps, cartridges, miners' fuse and toy arms, 10 per cent.; all other tin plate, steel and iron manufactures, prohibited; vessels, per ton, \$4.80; anchors, 100 kilos., \$2.40 to \$3.60; iron cables, 100 kilos., \$9; other cables, 12 per cent.

Coal and coke, 100 kilos., 2c.; bricks, 1000, 96c.; grindstones, free; sawed marble, 100 kilos., 20c. to 30c.; potash, free; borax, crude, free; ditto, manufactured, 100 kilos., \$10 to \$13.20; carbonate of magnesia, 100 kilos., \$4.80; ditto of lead, free; slates for building, 1000, 80c.; school slates, 100, \$2; extract of logwood and other dyewoods, prohibited; bone black, free; starch, 100 kilos., \$5.04; glue, free; rosin and resinous products, free; candles, 5 to 10 per cent.; pottery and chinaware, 100 kilos., \$1.44 to \$7.48; glassware, 100 kilos., 4c. to \$7.20; paper, paperware and books, 100 kilos., 2c. to \$7.20; tubes made of paper and asphaltum, 100 kilos., 20c.; prepared skins, 100 kilos., 60c. to \$140.88; cordage, 100 kilos., 48c. to \$6; prepared whalebone, 100 kilos., \$2.40; crude petroleum, each kilo. of pure oil 800 contained therein, 6c.; ditto ditto, 700, 8c.; refined petroleum, 800 and over, 100 kilos., \$7.40; ditto, 700, 100 kilos., \$9.40; empty casks, free; common brooms, free; oars, 100 meters, 48c. to

\$1.20; tool handles, 18 per cent.; button molds, 100 kilos., \$3.12; other woodenware, 100 kilos., 96c.; furniture, 18 per cent.; pianos, parlor and church organs, each, \$72 to \$96; smaller musical instruments, each, 15c. to \$3.64; wood, timber, lumber not over 80 millimeters in diameter, free; ditto, over 80 millimeters, the 100 meters, 1c.; masts and spars, free; veneers and staves, the 1000, 20c.; poles, the 1000, 6c.; millet stalks for brooms, free; cabinet wood in logs or planks over 2 decimeters in diameter, free; ditto in planks of 2 decimeters in diameter or less, 100 kilos., 20c. to 40c.; dyewoods in sticks and ground, free; carriages, fine, prohibited; carts and common trucks, 18 per cent., and 60c. the 100 kilos. gross.

The Courier des Etats-Unis.—The *Courier*, of this city, yesterday celebrated its 50th anniversary. During its long existence it has not only been the organ of the Franco-American population of the United States, but has by good management secured an extensive circulation in this country among the Swiss and better class of Germans, while in Canada, Spanish America and Brazil it is extensively read by educated people. We congratulate the *Courier* on its prosperity, so well deserved by the uniform excellence of its editorial matter, and wish it another half century of equal usefulness and success.

The total foreign exports from Boston between March 20th and April 10th were \$3,506,586, including \$2,669,199 to Great Britain, \$246,045 to Canada, \$56,127 to Newfoundland, \$64,642 to Mexico, \$22,818 to New Zealand, \$24,592 to Australia, \$4563 to the Azores, \$48,266 to British India, \$33,614 to Holland, \$43,257 to British West Indies, \$39,685 to France.

On the Remelting of Cast Iron for Foundry Purposes.

BY WILLIAM FORSYTH.

A knowledge of the physical properties of cast iron, such as tenacity, hardness and density, is of the highest importance to the engineer in designing and constructing machinery, and public works generally. In most tables of the strength of cast iron the resistance which this metal opposes to various strains is given as if there was no material difference between inferior and superior qualities.

The following will show the great difference between the higher and lower grades of cast iron. The density differs as 6.9 to 7.4, a difference equal to 31 lbs. per cubic foot. In tenacity it differs as 45,970 to 9000 lbs. per square inch, or as 5 to 1, and in transverse torsion and compression its strength differs as 2 to 1, and in hardness as 7 to 1.

It is our purpose to inquire into the cause of some of these differences, and to see how and why they are produced, especially in the iron foundry.

1. The Effect of Remelting Cast Iron in a Cupola.—The famous experiment of Fairbairn on the successive remelting of cast iron seems to have furnished the principal information generally known on the subject, and to have established the rule that the strength of cast iron increases with each remelting until it reaches the maximum at the twelfth. The results of this experiment, however, only apply absolutely to the particular pig iron used, the same grade of that iron melted in the same kind of a furnace and with the same kind of fuel.

The details of the experiment are, therefore, necessary for a proper understanding and application of the results, and I give them below: The pig was No. 3 Eglinton, hot blast, remelted in a cupola with coke. Three test pieces 1 inch square and 5 feet long were taken with each cast, and they were broken on supports 4 feet 6 inches apart by a center load. The experiment was continued up to the eighteenth remelting, and samples from the first, eighth, tenth and eighteenth melting were analyzed by Calvert.

No. of Remelting.	Spec. grav.	Transverse break load, 1 in. sec.	Transverse break load, 1 in. sec.	Mean ult. de. flac. in. 5 ft. apart.	No. of Remelting.	Spec. grav.	Transverse break load, 1 in. sec.	Transverse break load, 1 in. sec.	Mean ult. de. flac. in. 5 ft. apart.
1.....	6.960	490.0	1.440	10.....	7.108	866.9	1.626	1.626	1.626
2.....	6.972	441.9	1.446	11.....	7.113	851.9	1.636	1.636	1.636
3.....	6.886	401.6	1.486	12.....	7.160	692.1	1.666	1.666	1.666
4.....	6.938	413.4	1.260	13.....	7.134	634.8	1.646	1.646	1.646
5.....	6.842	431.6	1.503	14.....	7.530	603.4	1.513	1.513	1.513
6.....	6.771	438.7	1.380	15.....	7.248	371.1	0.643	0.643	0.643
7.....	6.879	449.1	1.440	16.....	7.232	357.3	0.583	0.583	0.583
8.....	7.025	491.1	1.753	17.....	Lost.	Lost.	Lost.	Lost.	Lost.
9.....	7.102	546.5	1.620	18.....	7.385	312.7	0.479	0.479	0.479

No. of Remeltg.	C.	Si.	S.
1.....	2.76	.77	.42
2.....	2.30	1.75	.60
3.....	3.29	1.98	.26
4.....	3.75	2.22	.75

For a comparison of strength with other iron I have converted the figures into their values in the United States government unit.

Fairbairn's maximum 602, equal to..... 9,342
A good sample of car wheel iron..... 9,378
A good sample of foundry iron for machinery..... 7,530

The chemical composition does not correspond to what we should expect from the increase in strength and density. The specific gravity increases nearly regularly up to the fourteenth fusion, being 6.969 at the first, 7.160 at the twelfth and maximum strength and 7.530 at the fourteenth. Unfortunately the percentages of free and combined carbon are not given, but I can only explain the increase in strength by the fact that the iron took up some carbon from the fuel in the cupola, which became combined by subsequent meltings and thus increased the strength and density. The other impurities, silicon and sulphur, which exist in greatest proportion in the eighteenth and last remelting, must also have been taken up from the fuel in the cupola.

In remelting in a cupola the iron is intimately mixed with the fuel, and is in contact with it when in a molten state. The conditions are thus very favorable for it to take up any impurities for which it has an affinity. Mr. Snell has proved the fact by some hundreds of analyses that there is a removal of silicon in working the cupola for Bessemer purposes; he also proved that in melting gray iron in a cupola with good coke it did not take up any appreciable

amount of sulphur, but that an amount of silicon was removed.

Very soft gray iron may be retained in a molten condition in a cupola in contact with good coke without taking up sulphur from it, but mottled or white iron or steel takes up sulphur with remarkable readiness. In melting cast iron for the manufacture of Siemens-Martin steel, an attempt was made to bring the metal to a state of white iron by melting it in a cupola, and by putting in a pair of tuyeres directed downward to blow on the surface of the melted metal; but it was found that as soon as the iron was thus made less gray it at once took up sulphur from the coke, so that steel made from it was unforgeable.

This difference in the effect of coke on gray and on mottled or white iron will explain in a measure why car-wheel makers find it necessary to use good anthracite coal in melting high-wheel irons, and also why we can use coke in melting our soft gray irons in the iron foundry—coke being by far the most economical fuel, so far as cost of melting is concerned.

CHEMICAL ANALYSES OF VARIOUS FUELS.

	Fixed Carbon.	Volatile Matter.	Ash.	Sulphur.	Phosphorus.	Moisture.
Best Anth. Coal.....	80.06	3.45	5.81	0.30	0.024	1.35
Average Anth. Cl. Connellsville C'ke.....	82.50	5.50	10.50	0.35	0.032	1.15
Remington ".....	87.46	11.32	0.69	0.029	0.029	0.49
Hallidaysburg Ck. Broadtop C'ke (K. & L. Co.).....	86.29	11.99	0.74	0.01	0.01	0.74
Mercer Co. bl'k C'k Connellsville Coal.....	89.28	25.49	1.70	0.04	0.04	1.80
Broadtop Coal (Barnet).....	68.50	22.38	8.00	1.12	0.01	0.01
Broadtop Coal (Kelly).....	71.72	19.68	7.50	1.70	0.01	0.01
Pittsburgh Coal (Irwin).....	61.45	37.74	5.81	1.04	not	not
English Coal.....	83.27	8.21	1.52	give n	0.01	0.01
Welsh Coal.....	86.50	12.10	6.50	0.90	0.01	0.01

It is said that the contamination of iron by sulphur in a cupola, from the coke, may be greatly diminished or almost entirely prevented by making the coke from coal finely crushed and mixed with a small amount of lime. In burning coke made in this way from fine coal mixed with 5 to 10 per cent. lime, the sulphur is fixed by the lime and most of it remains in the ash.

In remelting iron for the purpose of improving its quality it is doubtful whether a cupola, even with good fuel, is very efficient, and several remeltings would be required in a cupola to accomplish what might be done by one fusion in a reverberatory furnace. As explained in regard to Fairbairn's experiment, the increase in strength attending remelting in a cupola is more the result of a change in the condition of carbon (increasing the amount of combined carbon) than of any improvement in the purity of the metal. It is generally admitted that iron melted in a cupola in the ordinary way is rendered less fit for the Bessemer process than when tapped from the blast furnace and placed directly into the converter, and a number of Bessemer steel works in England (Barrow, Ebbw Vale, Vaughn & Co.) are now using the direct method. The Vulcan Works at St. Louis are arranged to work in that way. The quality of the steel is found to be better, and by a careful analysis of steel made by the use of the cupola, an amount of sulphur has been found which could not be accounted for by the quantity in the pig.

2. Remelting in a Reverberatory Furnace.—The superiority of castings made from iron melted in a reverberatory furnace is well known, this form of furnace being used in making chilled rolls, cannon and malleable iron castings. Its advantages are that the metal is not in contact with the fuel, and does not take up its impurities, and that a large surface is exposed, both in melting and in the pool after melting, to the oxidizing influence of the flame. Besides, it can be retained in fusion any desirable length of time, and we thus accomplish by one fusion what would require several in a cupola. Long-continued fusion seems to be as effectual in increasing the strength of iron as repeated meltings.

The following experiment illustrating this point was performed by Mr. T. J. Bramwell at the Woolwich Arsenal, in 1863: No. 1 Arcadia cold-blast pig iron from Nova Scotia was melted in a reverberatory furnace, and as soon as fused eight test pieces were cast, and the average tensile strength was found to be 16,800 lbs. per square inch; the iron was kept in fusion two hours longer and eight more tests were taken, and these gave an average tensile strength of 18,592 lbs. After the iron was in fusion 3 1/2 hours, tests were again taken, the iron breaking at 24,192 lbs., an increase of 50 per cent. The whole charge was then cast into pigs to be used again. On the next occasion the furnace was charged with one-half No. 1 pig and one-half of the pigs which had been subject to the prolonged fusion. Tests cast immediately after fusion broke at 24,640 lbs., and a test cast four hours afterward gave an average tensile strength of 41,440 lbs., the strongest breaking at 43,904 lbs. The specific gravity of the metal increased from 7.09 for the No. 1 pig to 7.29 in the strongest sample. Another experiment on the effect of prolonged fusion on cast iron was made at Algriss Foundry, Boston, 1849. The reverberatory furnace was charged with a mixture of four parts Armenia pig and one part Copake pig:

First Fusion—			Second Fusion—		
Total time in Specific fusion, gravity.	Tenacity.	Gravity.	Total time in Specific fusion, gravity.	Tenacity.	Gravity.
H. M.			H. M.		
15	7.175	20.336	4 45	7.281	33.423
1 15	7.022	25.684	5 45	7.288	30.644
2 15	7.215	27.456	6 45	7.327	36.312
3 15	7.229	26.736	7 15	7.334	35.870
4 15	7.240	29.227	7 45	7.334	37.557

These results seem to show that a prolonged exposure of liquid iron to an intense heat increases its tenacity and density, and that this increase directly corresponds with the times of exposure.

The following experiments by Major Wade on remelting different grades of Greenwood pig at West Point Foundry, 1851, are also of interest. They exhibit the qualities of Nos. 1, 2, 3 pig made at the same furnace from the same ores, and they show that each is modified by fusion at the

foundry. The No. 1 pig had a density of 7.032 and tenacity of 15,129 lbs. The same iron, after being three times remelted in a reverberatory furnace, had a density of 7.301 and a tenacity of 35,786 lbs., an increase in density equal to 17 lbs. per cubic foot and in tenacity in the ratio of 100 to 236; No. 2 pig had a specific gravity of 7.153 and tenacity of 27,153 lbs.; No. 3 pig had a specific gravity of 7.230 and tenacity of 34,923 lbs.; 10 parts No. 1, second melting, and four parts No. 3, first melting, gave specific gravity 7.259 and a tenacity of 36,916 lbs.; eight parts No. 1, second melting, and six parts No. 3, first melting, gave specific gravity 7.270 and tenacity of 39,373 lbs.; three parts No. 1, three parts No. 2, two parts No. 3, all of the second melting, gave specific gravity 7.251 and a tenacity of 37,789 lbs.

The softest Greenwood iron will endure a greater number of remeltings with advantage than the higher grades. The maximum tenacity of No. 1 was attained at the third remelting; in Nos. 1 and 2 mixed at the second remelting, and in Nos. 1, 2 and 3 mixed at the first melting. At the second remelting of the latter the tenacity of the test pieces diminished while it increased in the gun heads. It appears that when iron is in its best condition for casting into test bars 2 inches square, it is then in a state which requires an additional fusion to bring it to its best condition for casting into the massive bulk of cannon. In selecting and preparing iron for large castings we may, therefore, proceed by repeated fusions or by varying the proportion of the different grades until a good tenacity is attained in the test bars, and the iron will then be in good condition to be again remelted and cast. The density of the several grades of pig iron is in the order of their respective numbers, and they all increase in density at each additional fusion. The density is greater in small test bars which cool quickly than when cast into larger masses which cool slowly. The tenacity increases quite uniformly with the density until the latter ascends to some point, after which an increase of density is accompanied by diminished tenacity. There are cases where a medium tensile strength is observed to accompany a high density, and the reverse where low density is found in connection with medium tenacity. When the first condition occurs, the metal generally has either a very high mottle with white silvery hue or is of a uniform dull and chalk-like appearance, a circumstance which may be attributed to its being too frequently remelted or to too long a continuance in the furnace, or to the fact that it was cooled too suddenly in casting. In the second case, where we found low density with good tenacity, it is observed that the surface of the fracture presents a dark carbonaceous appearance, yet with a closely aggregated crystallization. The excess of graphitic carbon renders its density necessarily low, when by reason of its close structure and the increased numbers of its crystals its tenacity is high. This is the characteristic fracture of No. 1 cold-blast charcoal iron, and the peculiar crystallization may be due to the absence of a large percentage of impurities, either silicon, sulphur or phosphorus, and their absence would also explain the increase in strength. The low specific gravity does not indicate purity, however, as pure iron has a higher specific gravity than impure.

The turning point of density at which Greenwood attains its maximum tenacity is about 7.27. The density may be extended so high as to endanger the soundness of the casting. As the density of iron increases, its liquidity when melted is diminished. This causes it to solidify quickly and form cavities in the interior of the casting, and this point of density is below the maximum of tenacity. We may, therefore, safely continue iron in fusion with increasing improvement in its quality so long as sufficient liquidity remains to insure exemption from cavities in the casting. It is more important to determine this point than the maximum tenacity, and it can be conveniently ascertained by the fracture of small test pieces taken during different periods of fusion.

I have found a convenient shape for test pieces to determine the relative hardness of cast iron to be a wedge about 6 inches long, 3 inches wide, 1/2 inch thick and tapering to 1-16 inch thick, with a groove lengthways and in the middle. The fracture will exhibit white iron at the thin end and dark gray at the large end, and a test cast with hard iron will exhibit the white iron at a greater distance from the small end, and the mottled, bright and lighter shades will be found advancing toward the large end. This method, though less reliable than that of an actual measure of the density and strength, is convenient because of its ready application at short intervals while the iron is in fusion, and a practical eye will soon be able to mark the progress of the changing quality of the iron and to determine the proper time for casting. By making larger wedges, so that the thickness is equal to that of the casting to be made, we get a fair indication of the quality of the iron in the casting as regards grain and hardness. For small castings which cool rapidly, remelted iron is not charged, but soft No. 1 pig must be used to secure gray iron in the casting.

I had a good opportunity to make an experiment on the effect of remelting in a cupola to ascertain the increase in strength, which I carried out as follows: A mixture of 40 per cent. car wheels, 25 per cent. Morgan (charcoal), 30 per cent. Crane and 5 per cent. steel was charged for a large anvil, and it was afterward found that the mold was not dry enough to cast that day. A test piece was taken and the iron was run into pigs. The next day these pigs were charged alone and another test piece made. The first broke at 15,000 lbs. (transverse, 2 inches square, 12 inches between supports), and the second at 18,000 lbs., an increase of 20 per cent. by one remelting. In our practice the strength of remelted iron is shown in the superior strength of scrap which represents an unknown number of remeltings, but exceeding two. Our ordinary No. 1 anthracite pig iron remelted once breaks at 12,000 and 14,000 lbs. (transverse), and test pieces made from all scrap require 19,000 and 20,000 lbs. to break them. A mixture of 92 per cent. scrap and 8 per cent. Glamorgan broke at 19,400 lbs., and another mixture of 88 per

* The franc is calculated at 20c.

cent. scrap and 12 per cent. Glamorgan broke at 21,000 lbs.

I have found that, in making strong mixtures by the addition of high grade irons or steel, we cannot exceed a transverse strength of 18,000 lbs. without increasing the hardness so that the castings are finished with difficulty. The quality of hardness in cast iron appears to correspond more nearly with density than any other quality, and although the tenacity and hardness generally coincide with density in the different grades of iron of the same make or from the same furnace, the density of any one make will not indicate the hardness or tenacity of another, or different make with any degree of exactness. We have seen that in remelting iron for the purpose of purifying it and increasing the strength, in the best kind of furnace the removal of silicon and other impurities is accompanied by a change in the condition of the carbon, increasing the percentage of combined carbon, rendering the metal liable to shrink so that it will not fill sharp corners, causing an unsound casting and making it too hard for finish, and that this occurs before reaching the maximum of density and strength, thus limiting our efforts in this direction. We look then for some other method of treating cast iron, which we can hardly expect to be done in the blast furnace, but which may be started there.

We have also found that the most elaborate physical tests made to develop the laws showing the relation between density, tenacity and hardness, and how these qualities are affected by treatment, making different grades in the blast furnace, the effect of remelting in the cupola, and continued fusion in the reverberatory furnace and the effect of different modes of cooling and casting, have only given us laws which apply to some particular kind of iron, and we conclude that chemical analyses in connection with physical tests is the only method of determining the best kind of iron for foundry purposes and the best method of treating it in order to get it in the best possible condition for casting.

The ideal foundry iron for machinery would seem to be pure iron in combination with sufficient free carbon to secure a sound, sharp casting; and this carbon finely and regularly distributed over closely aggregated crystals, which would insure high strength with proper degree of hardness—an iron which will endure a tensile strain of 40,000 lbs., and make a solid casting not too hard to finish.

There is such an intimate relation between carbon and silicon in cast iron, that it would be interesting and useful to know if it is possible to remove nearly all the silicon without causing the carbon to combine to such an extent as to make white iron. It would also be useful to know the following: 1st. The difference between a certain grade of pig iron of a given strength and hardness, and iron of the same kind but lower grade, having the same strength and hardness produced by remelting. 2d. The cause of hardness in cast iron and what elements increase it. 3d. The composition of iron having a maximum tenacity with minimum hardness. 4th. Will anything besides free carbon cause iron to melt liquid? 5th. Will this be effectual in iron containing a large percentage of combined carbon? and 6th. What are the conditions which favor small and regular crystallization in soft iron?

ALTOONA, PA., April 8, 1878.

INDUSTRIAL ITEMS.

MAINE.

The fire in the furnace of the Katahdin Iron Works has been extinguished, and smelting operations will be closed for some two or three months. A crew of about 20 men will be kept busy digging ore and making charcoal.

NEW HAMPSHIRE.

Lafayette Hall's nut and bolt factory at Newmarket was destroyed by fire last week. Loss, \$34,000; insurance, \$20,000.

VERMONT.

The Tyler Foundry at Brattleboro', long idle, and which was recently sold to other parties, is to be started up again for the manufacture of fine castings.

MASSACHUSETTS.

The Lowell Machine Shop had a large contract for machinery, to supply the Sagamore and Border City Mills, of Fall River, now so abruptly closed by the dishonesty of their treasurer, G. T. Hathaway. Only a little of this was completed, and none had been shipped, so that the loss to the corporation it is thought will be nothing. But about 200 men will have to be discharged, for a time at least.

The upper portion of the old Atlantic Works, at East Boston, are now occupied by the American Arms Company, of which George Linder is president, Francis H. Raymond, treasurer and business manager, and George H. Fox, superintendent. The business consists mainly in making light breech-loading shot-guns, and the resources of the factory are taxed to their capacity, the company, indeed, being behind their orders. They employ about 50 men at present, and intend shortly to have 100 actively at work.

The Northampton Emery Wheel Company at Leeds, have re-elected Ira Dimock, president, and Col. J. L. Otis, clerk and treasurer; and these gentlemen, with L. B. Williams, S. B. Fuller and A. B. Clark, constitute the board of directors. The company is in excellent condition and the treasurer made a very gratifying exhibit of the result of the last year's operations. A good dividend was declared and a surplus remains in the treasury.

CONNECTICUT.

The business of the Northfield Knife Company has been augmented to such an extent that the mail facilities of the town have had to be increased for its accommodation.

The Windsor Locks Steel Works, which have 6 months orders ahead, recently suffered a delay of 10 days by the breaking of their main shafting.

The Scovill Manufacturing Company, of Waterbury, are putting up an exhibit of brass works and other articles at the Museum of Industrial Art, in New Haven.

The Reynolds Bridge Knife Company are

AMERICAN SCREW CO.,

Providence, R. I.

Manufacturers of

IMPROVED Gimlet Pointed Wood Screws, Patented May 30, 1876.

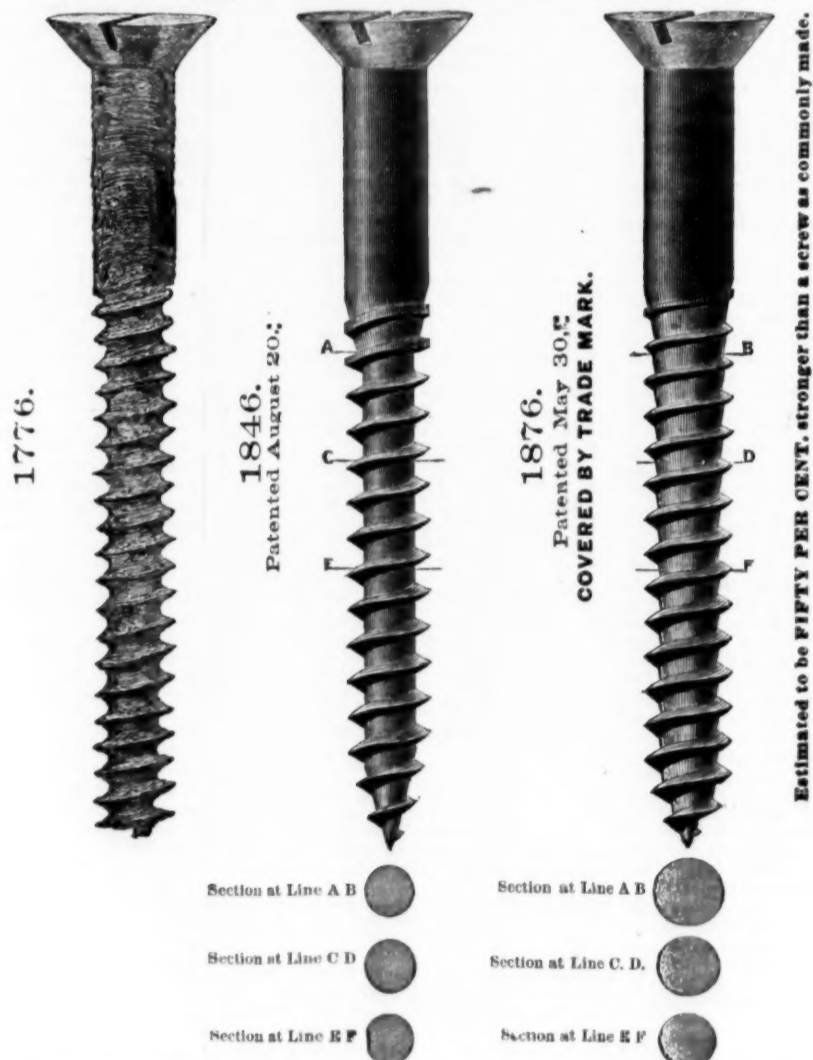


After forty years' experience we offer to the trade our Centennial Screw, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the improved article only. To introduce them, they will be sold at same price as the old style screw.

The new screws will be packed in manila colored boxes with new label covering end of box, and enlarged figures showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.



The above drawings show the progress of making screw from the old blunt point to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our new screw that not only is the sharp angle avoided, but the strength very much increased, as illustrated above. See sections at lines.

CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

clearing away the debris of their recently-burned factory, preparatory to rebuilding.

NEW YORK.

A very difficult casting was made at the Eagle Iron Works, Buffalo, last week. It consisted of a drum upon which the rope for drawing coal cars up an inclined plane was to be wound. The outside diameter of the drum was 5 feet, and its face 32 inches, with a flange 2 inches wide all around the rim on the inside on both edges, and a special groove for a 1½-inch rope running over the entire face of the drum. The hub was 10 inches in diameter and 18 inches long, with a 5-inch core through the hub and 2 sets of arms extending from the hub to the rim. The entire mold for this casting was made in green sand, except those of the arms, which were made in dry-sand cores and laid in the center core. The latter was swept up into the desired shape, as was also the outside of the mold with the special groove, covering the entire face of the drum; 4500 lbs. of molten iron was required to pour the mold, and when the casting was turned out it was as perfect as if molded in dry sand or loam. To make castings of this shape and size is no great feat, as much larger drums than this one are turned out at some of the foundries in the coal regions almost every week; but the molding of such a piece in green sand is something that scarcely one founder in a hundred would undertake to do, so that this casting is probably one of the most difficult ever made in green sand in this or any other country. In the coal regions where drums of this kind are made they are always molded in loam, and in many foundries plain pulleys of even less diameter than 5 feet are often molded in loam, because they do not possess the necessary pattern or ring. In the Eagle Foundry, however, all pulleys are molded or swept up in green sand, and under the direction of their experienced foreman, Mr. John Bowen, pulleys 12 feet in diameter, with a 30 inch face, have been swept up in green sand, and as perfect a casting turned out with it as could have been made with a loam mold, at a much less expense.

The Buffalo Scale Company have received orders from the Wheeling Iron and Nail Works for a 40-ton railroad track scale with their patent combination beam which dispenses with the use of weights, the weighing being done exclusively with the poises, thus avoiding the handling of weights and the trouble frequently caused by the loss or misplacement of weights. With the combination beam the tare may be taken off when weighing, thus obviating the necessity of figuring to ascertain the weights less the tare. They have also received orders from the same company for one of their furnace charging scales, which is arranged with a patent combination beam upon which the weighing is done exclusively with the poises. It may be locked up so that the employees about the furnace cannot change the weights or know how the furnace is being charged.

The Shepard Hardware Company of Buffalo are making extensive preparations to manufacture their "sensible fluter." The roller of this fluter will be made 2½ inches in diameter, which will make it work much easier and flute much better than any of the small roller fluters. The roller fluting plate and stand will all be nickel plated, and two heaters will be furnished with each fluter, so that the fluter may be kept constantly at work without having to stop to heat the heating iron. This company are also preparing to manufacture their patent combination spider and steamer on a large scale, and will in a short time start their works on full time with a full complement of men.

The Kent Iron Co. are running their furnace and making four casts daily.

Messrs. Delamater & Co., New York city, speak of business as more active, their works giving employment to 600 men. Among their recent contracts is a wooden launch, to be fitted with double engines, for the Light House Board. The hull is building by Carl, at City Island. At the same foundry they have orders from the Pictet Artificial Ice Company, for the construction of several machines which are said to make ice at a cost not exceeding \$1 per ton.

PENNSYLVANIA.

The firm of Evans & Baird, agricultural machine manufacturers, of West Chester, are in the hands of the sheriff.—Norristown Herald.

The Plymouth furnaces at Conshohocken are both at work now and doing well.

All the furnaces in the pipe mill of the Reading Iron Co. were idle last week and undergoing repairs. A new furnace, to be known as Furnace No. 4, is being built.

The furnace of the Warwick Iron Co. week before last yielded 338½ tons of iron—the largest by far ever made by any furnace in the Schuylkill Valley.

The rail mill of the Allentown Rolling Mill started up Monday morning, the 22d ult., having received an order for 300 tons. This will keep the mill in operation one week. If additional orders are received work will continue a longer time.

The coal works of Lee & Co. at Rock Point have not been doing much for a few weeks, owing to some difficulty with their diggers. The Harmony bank employs about 50 men, and is working.

The coal works of Davidson, Green & Co., at Wampum, under the supervision of Mr. J. M. Davidson, are running steadily, and have been doing a fair business for some time past. They now employ about 50 miners, and will add more to their force as business revives.

The Lawrence Ore Co. are now operating their ore banks at Wampum, and give employment to about 60 men.

We clip the following from the Sharon Herald of the 26th ult.: For the week closing the 20th, at the Kimberly Mill, puddle, guide, and both hoop mills double turn; bar mill single. The difficulty among the nail feeders, noted last week, is settled amicably to both parties, and the nailers and feeders are clicking away just as though nothing had happened to disturb the good feeling between employer and employee. Keel Ridge Furnace is working smooth and good. At the Westernman Mill, puddle and guide mills double turn; bar, sheet and hoop mills, single turn; nail factory on four days; chain factory, all the fires working, and about one month behind their orders. Both blast furnaces doing extremely well. Slag fur-

**B. KREISCHER & SON,
New York Fire Brick &
STATEN ISLAND
CLAY RETORT WORKS,**

Established 1845.

Office, foot of Houston Street, East River,
NEW YORK.

The largest stock of Fire Brick of all shapes and sizes on hand, and made to order at short notice. Capela Brick, for McKensie Patent, and others. Fire Mortar, Ground Brick, Clay and Sand. Superior Kaolin for Rolling Mills and Foundries. Stone Ware and other Fire Clay and Sand, from my own mines at New Jersey and Staten Island, by the cargo or otherwise.

NEWTON & CO.,

Successor to

PALMER, NEWTON & CO.,

ALBANY, N. Y., Manufacturers

**FIRE BRICK
Stove Linings,
Range and Heater Linings
Cylinder Brick, &c., &c.**

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Manufacturers of

**FIRE BRICK
And Furnace Blocks
DRAIN PIPE & LAND TILE.
Woodbridge, - - - N. J.**

A. HALL & SONS, Perth Amboy, N. J.

ESTABLISHED 1845.

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FIRE BRICK

of reliable quality for all purposes, manufactured at the best New Jersey Fire Clays. Also, Architecture Terra Cotta, Fire Clay, Fire Sand, Kaolin, Ground Fire Brick and Diamantine Building Brick.

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AND
FIRE BRICK WORKS.**

Manufacturers of Clay Retorts, Fire Bricks, Gas House and other Tile, Capela Brick, &c. Dealers in and Miners of Fire Clay and Fire Sand. Clay bank at Burt's Creek, New Jersey. Manufacture: Van Dyke, Elizabeth, Richards and Partition Sls., Brooklyn, N. Y. Office No. 28 Van Dyke St.

**MANHATTAN FIRE BRICK
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ADAM WEBER, Proprietor.

Office, 633 E. 15th St., N. Y. Clay Retorts, Enameled for Gas Houses; Retorts for burning raw bone and re-burning bone for Bone Black. Fire Bricks, Fire Blocks, Capela and Range Bricks of all shapes and sizes. The best fire clay from my own Clay Beds at Perth Amboy, N. J.

Watson Fire Brick Manufactory
ESTABLISHED 1838.

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**FIRE BRICK,
For Rolling Mills, Blast Furnaces, Foundries,
Gas Works, Lime Kilns, Tanneries, Boiler
and Grate Setting, Glass Works, &c.
FIRE CLAYS, FIRE SAND, AND KAOLIN FOR SALE**

**HENRY MAURER,
Proprietor of the
Excelsior Fire Brick & Clay
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Manufacturer of FIRE BRICK, HOLLOW
BRICK AND CLAY RETORTS.

WORKS PERTH AMBOY, NEW JERSEY
Office & Depot: 418 to 422 East 23d St., N. Y.

TROY FIRE BRICK WORKS
Troy, N. Y.,

JAMES OSTRANDER & SON,

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Manufacturers of

**FIRE BRICK,
Tuyeres, Tiles, Blast Furnace Blocks, &c. Miners and
Dealers in Woodbridge Fire Clay and Sand, and Staten
Island Kaolin.**

Established 1864.

**GARDNER BROTHERS,
MANUFACTURERS OF**

**STANDARD SAVAGE
Fire Brick, Tile & Furnace Blocks,
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Clay Gas Retorts and Retort Settings,
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Clay Gas Retorts,
Retort Settings,
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Eighteen years' practical experience.
CYRUS BORGNER. WM. J. O'BRIEN

**CHAS. N. BACON,
Felting & Wadding Manufactory,
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Patent Felt Buffer Wheels for Hardware and
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Platers, Jewelers, &c. Felt for Boilers and Steam
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Office & Salesroom 72 Exchange Place Boston.



SPECIAL NOTICE.

Having learned that some of the Oxford Patent Welded Shovels first produced by us have failed to give satisfaction, owing to the imperfect manner in which they were welded, we would explain that this was owing to the defective machinery first used by us, and would state that, as soon as the defect was ascertained we employed improved machinery, and are now able to guarantee them perfectly welded and strong in every respect, and that they will give entire satisfaction.

All Oxford Shovels, Spades or Scoops that fail to hold at the weld will be replaced by us with good ones without cost to the purchaser.

Respectfully,

B. ROWLAND & CO.,

No. 27 N. Fifth Street,

PHILADELPHIA.

nance working. Stewart Furnace No. 2 working up to her average, and not gaining any on the E. & P. Railroad.

The Oil City Boiler Works are to be removed to Jamestown, N. Y.

About 420 hands are employed in the P. & R. Car Shops, Reading, who are engaged in repairing passenger and freight cars, and work eight hours a day. No new cars of any kind are being built just now. While no men are suspended or have been discharged, no new hands are employed to take the places of those who quit voluntarily and remove from Reading and engage in other occupations.

The Reading Iron Company, who employ between 700 and 800 hands in their rolling mill, tube works, nail factory, furnaces, machine shop, foundry and forge, paid out some \$30,000 last Saturday afternoon.

A change in the management of the North Lebanon Furnace, at Lebanon, is announced in the Lebanon News, based on a rumor. The present manager is Mr. Charles B. Forney, who has occupied that position during the past 25 years or more with entire acceptance, and to whose skill and energy the successful operations of the furnace is largely due. Mr. Forney was among the first managers to undertake the manufacture of iron with anthracite coal, which led to its general adoption and a subsequently increased production. Mr. Forney, it is reported, will be succeeded by Mr. Horace Brock, of Philadelphia, who will assume the management on July 1st.

The Steel Works at Beaver Falls are running to their full capacity, and are still behind with orders.

The Beaver Falls saw works are very busy, and running to their full capacity. They have received an order for a band saw 60 feet long and 9 inches wide, the largest ever made.

It is said that Ihmsen, Lake & Co., are talking of starting up their coke works at Everson, on the Mount Pleasant branch.

The Williamsport Gazette and Bulletin says: "Thus far this month the Messrs. Snyder Brothers have shipped one of their manufacture of the Parker shingle machines to L'Anse, on Lake Superior; one to Jacksonville, Florida; one to Marion, North Carolina, and one to Brazil, South America. These machines have been greatly improved by patents obtained by the manufacturers, making them much superior to the original invention."

Stokes & Parrish, Philadelphia, are now putting in at the Glamorgan Furnaces, Lewistown, one large hydraulic double-action elevator, which handles two platform cars at once, lifting ore and coal to the top of the stack. This firm has also just put in for the Standard Oil Co., New York, four double-drum hoists which handle two batches at once. They have also put up a fine hydraulic passenger elevator at the Bingham House and another one at Baltimore.

At the Black Diamond File Works, Philadelphia, G. & H. Barnett, proprietors, business is said to be unusually active. They have been working for some time past with a full force of hands, but are unable to keep pace with their orders, some being from distant points—Mexico, Brazil and European countries.

PITTSBURGH AND VICINITY.

The Great Western Gun Works, of Pittsburgh, have received an order from Norway for a lot of cartridges.

The Dexter Spring Co., at Hutton, are increasing their business very largely. They have shipped this year about 1000 Dexter springs, against 550 last year.

The coal tipple of Hays Bros., at Six Mile Ferry, was entirely destroyed by fire on Tuesday evening, the 23d ult. Loss, \$10,000. It is supposed it was struck by lightning.

A meeting of the directors of the Hawk's Nest enterprise was held in Pittsburgh week before last. Statements from the different committees and clubs were made and a resolution passed to continue the efforts of the association. New officers and a new board of directors was elected, as follows: Isaac Cline, president; J. D. Smullen, secretary, and Wm. F. Willock, treasurer. Directors, Hugo Drasher, A. D. Hamilton, John Brinkman and Thos. Martin.

The Excelsior Glass Works are enlarging their capacity. The furnace is to have larger pots, and six new shops are being got in readiness to start.

Hartley's Glass Works, Pittsburgh, are now running to pots on full time.

Evans, Sell & Co. propose to run 40 shops when they start their works.

The Keystone Glass Works, of Pittsburgh, are now working on a large order from South America. The present order is for 2000 dozen chimneys.

Hubbard, Bakewell & Co., ax and shovel manufacturers, Pittsburgh, are running full time, employing several hundred men and boys.

WEST VIRGINIA.

The West Virginia Fire Brick Company has been formed for mining, manufacturing, buying and selling fire-clay and its products. The principal office of the company to be at New Cumberland, Hancock county. The capital stock of the company is \$3,415, and \$341.50 has been paid.

It is reported that the Lovell and Dana Coal Works have ceased operation entirely, throwing a large number of miners out of employment.

OHIO.

The following is the Board of Directors of the Mingo iron works, elected on Saturday, the 20th ult. M. W. Burt, Wm. Dean, D. J. McGarry, Jos. Graves, James Roberts, D. W. Murry and Geo. P. Litch. Maj. M. W. Burt was elected president, and Mr. Geo. A. Dean, secretary.

One of our exchanges says: Since our last issue we have learned that Swift's Rolling Mill Co., of Newport, design constructing three reservoirs on their mill ground for the purpose of supplying the mills with water, the three to have a capacity of 2,000,000 gallons. This is done for the purpose of lessening the cost of water used in the establishment, which now consumes of our water works water an average of 100,000 gallons daily, costing, at 15 cents per thousand gallons, \$15 per day.

A large portion of the Greenwood Foundry property at Cincinnati has been sold to a Baltimore firm for \$60,000. The building has been refitted and will be used for the

purpose of canning and preserving fruits and vegetables.

The buildings of the cast steel department of the Burgess Steel and Iron Works of Portsmouth, lately burned down, have been replaced, and this part of the works is again in active operation. We understand that these works have been doing a more extensive business this season than ever before, disposing of large quantities of their steel. They now steadily employ from 100 to 125 men.

The Cherry Valley Rolling Mill at Leetonia has been leased for five years by the American Railway Supply Co.

The Pomeroy Coal Co. have renewed their contract with the miners in the Peacock and Dabney banks at the old price, 2 cents per bushel.

At Leetonia the Grafton mine employs about 70 men and is running about two-thirds time. The Leetonia mine employs about 80 men and runs two-thirds time.

The coal banks in Liberty township, near Youngstown, are in full operation again, running on full time and mining about 1200 tons per day.

The Youngstown Rolling Mill was idle week before last taking stock, but started up on Monday, the 22d ult., double turn.

The Morse Bridge Works, now building in this city, are rapidly approaching completion. We learn from conversation with one of the proprietors that they expect to have the works in operation in about three weeks. He says that the orders are accumulating so fast that it is absolutely necessary that they should get to work as soon as possible. In one day last week they booked orders for seven bridges, and contracts for building 15 bridges have already been made.—Youngstown Register and Tribune.

Lawrence mill at Ironton was running double turn last week.

Sarah Furnace is making a good article of pig iron from one-fourth blue and three-fourths gray ore.

Messrs. Newton & Cox of Cleveland have just finished a new milling machine for their own use which they say is the largest in the United States. It is entirely automatic in its action, is quite unlike any other in use, and is made under patents owned by this firm. The firm have also recently added a large new planer to their plant, and have a new lathe now on the way here from the East. They are now building, in addition to other work, a large milling machine. It is a splendid specimen of plain, solid, compact, honest workmanship. They have recently gone into the manufacture of milling machines, grinding machines and cutting-off machines, and are fully prepared to fill orders for work of this class. Since January 1st they have made large numbers of their patent self-feeding reamer, the new device of which is a screw point, making better work, the makers say, than any other reamer in use. They are shipping these and their twist drills, taps and dies, to many of the best machine shops in the country.

W. S. Craine & Co., of Cleveland, report business very good, and they are putting on new workmen every day. At present they employ 49 men, making general foundry work, machinery and light castings, stable furniture, iron settees and lawn furniture, pulleys and stock food steamers. They have recently begun the manufacture of cornice machinery of late improved patterns.

It is reported that the Belfont Furnace will soon blow out, to remain idle for perhaps several months. The furnace was, so far as the hearth, bosh, &c., are concerned, never in better condition, and is working splendidly on native ore alone; she is making excellent iron at a figure never before reached here or perhaps elsewhere in the United States.

The first order at the Oviatt Agricultural Works, Hudson, is for 10 wagons and 10 thrashers.

ILLINOIS.

At a recent meeting of the North Chicago Rolling Mill stockholders the action of the directors in purchasing the Milwaukee mills was ratified. The company now propose to increase their capital stock to \$4,000,000. Of this five-eighths will represent the Chicago and three-eighths the Milwaukee mills.

KENTUCKY.

The Princess (Boyd county) Furnace was completed in the middle of May last and has been in continuous operation ever since. Mr. John Griffith, who is now blowing the furnace, reports an average daily make of 18 tons of strictly No. 1 and No. 2 pig metal, which, considering her size, is a highly satisfactory result.

The work on the boiler stack of the Norton Iron Works, Ashland, is still progressing; the stack is about 110 feet high; there is about 30 feet more to go on the top yet, making the stack 150 feet high when finished. With the exception of the stack they are ready to go to work at any time; the stack will be finished in a week or two.

Mt. Savage Furnace commenced receiving her first charcoal on Monday, and with continued fair weather will blow in on the 5th of May.

Hunnell Furnace was to go in blast last Monday.

MISSOURI.

Joseph P. Card & Amos F. Hoffer, dealers in pig iron at St. Louis, have filed a petition in bankruptcy. The liabilities are \$102,000; assets, \$117,000. Among the creditors is J. F. Card, Cleveland, \$49,000.

TENNESSEE.

As showing an increasing interest in the Southern iron district in more scientific treatment of ores and fuels, we note the fact that Mr. W. B. Caldwell, a first-class chemist, late of Louisville, Ky., has opened a laboratory in rooms connected with the Roane Iron Company's office in Chattanooga. Mr. Caldwell is a relative and has been a student of the celebrated chemist, Prof. J. Lawrence Smith. He will be of great benefit to the ironmasters of the South, where his kind of scientific knowledge has long been needed as a factor in ironmaking.

The Chattanooga Iron Manufacturing Company blow out their furnace last week for repairs. A new hearth and bosh will be put in; all needful repairs of the machinery, hot-blast, &c., will be made as rapidly as possible, and the furnace will, if possible, be put in blast again by the middle of May.

cent. scrap and 12 per cent. Glamorgan broke at 21,000 lbs.

I have found that, in making strong mixtures by the addition of high grade irons or steel, we cannot exceed a transverse strength of 18,000 lbs. without increasing the hardness so that the castings are finished with difficulty. The quality of hardness in cast iron appears to correspond more nearly with density than any other quality, and although the tenacity and hardness generally coincide with density in the different grades of iron of the same make or from the same furnace, the density of any one make will not indicate the hardness or tenacity of another, or different make with any degree of exactness. We have seen that in remelting iron for the purpose of purifying it and increasing the strength, in the best kind of furnace the removal of silicon and other impurities is accompanied by a change in the condition of the carbon, increasing the percentage of combined carbon, rendering the metal liable to shrink so that it will not fill sharp corners, causing an unsound casting and making it too hard for finish, and that this occurs before reaching the maximum of density and strength, thus limiting our efforts in this direction. We look then for some other method of treating cast iron, which we can hardly expect to be done in the blast furnace, but which may be started there.

We have also found that the most elaborate physical tests made to develop the laws showing the relation between density, tenacity and hardness, and how these qualities are affected by treatment, making different grades in the blast furnace, the effect of remelting in the cupola, and continued fusion in the reverberatory furnace and the effect of different modes of cooling and casting, have only given us laws which apply to some particular kind of iron, and we conclude that chemical analyses in connection with physical tests is the only method of determining the best kind of iron for foundry purposes and the best method of treating it in order to get it in the best possible condition for casting.

The ideal foundry iron for machinery would seem to be pure iron in combination with sufficient free carbon to secure a sound, sharp casting; and this carbon finely and regularly distributed over closely aggregated crystals, which would insure high strength with proper degree of hardness—an iron which will endure a tensile strain of 40,000 lbs., and make a solid casting not too hard to finish.

There is such an intimate relation between carbon and silicon in cast iron, that it would be interesting and useful to know if it is possible to remove nearly all the silicon without causing the carbon to combine to such an extent as to make white iron. It would also be useful to know the following: 1st. The difference between a certain grade of pig iron of a given strength and hardness, and iron of the same kind but lower grade, having the same strength and hardness produced by remelting. 2d. The cause of hardness in cast iron and what elements increase it. 3d. The composition of iron having a maximum tenacity with minimum hardness. 4th. Will anything besides free carbon cause iron to melt liquid? 5th. Will this be effectual in iron containing a large percentage of combined carbon? and 6th. What are the conditions which favor small and regular crystallization in soft iron?

ALTOONA, PA., April 8, 1878.

INDUSTRIAL ITEMS.

MAINE.

The fire in the furnace of the Katahdin Iron Works has been extinguished, and smelting operations will be closed for some two or three months. A crew of about 20 men will be kept busy digging ore and making charcoal.

NEW HAMPSHIRE.

Lafayette Hall's nut and bolt factory at Newmarket was destroyed by fire last week. Loss, \$34,000; insurance, \$20,000.

VERMONT.

The Tyler Foundry at Brattleboro', long idle, and which was recently sold to other parties, is to be started up again for the manufacture of fine castings.

MASSACHUSETTS.

The Lowell Machine Shop had a large contract for machinery, to supply the Sagamore and Border City Mills, of Fall River, now so abruptly closed by the dishonesty of their treasurer, G. T. Hathaway. Only a little of this was completed, and none had been shipped, so that the loss to the corporation it is thought will be nothing. But about 200 men will have to be discharged, for a time at least.

The upper portion of the old Atlantic Works, at East Boston, are now occupied by the American Arms Company, of which George Linder is president, Francis H. Raymond, treasurer and business manager, and George H. Fox, superintendent. The business consists mainly in making light breech-loading shot-guns, and the resources of the factory are taxed to their capacity, the company, indeed, being behind their orders. They employ about 50 men at present, and intend shortly to have 100 actively at work.

The Northampton Emery Wheel Company at Leeds, have re-elected Ira Dimock, president, and Col. J. L. Otis, clerk and treasurer; and these gentlemen, with L. B. Williams, S. B. Fuller and A. B. Clark, constitute the board of directors. The company is in excellent condition and the treasurer made a very gratifying exhibit of the result of the last year's operations. A good dividend was declared and a surplus remains in the treasury.

CONNECTICUT.

The business of the Northfield Knife Company has been augmented to such an extent that the mail facilities of the town have had to be increased for its accommodation.

The Windsor Locks Steel Works, which have 6 months orders ahead, recently suffered a delay of 10 days by the breaking of their main shafting.

The Scovill Manufacturing Company, of Waterbury, are putting up an exhibit of brass works and other articles at the Museum of Industrial Art, in New Haven.

The Reynolds Bridge Knife Company are

AMERICAN SCREW CO.,

Providence, R. I.

Manufacturers of

IMPROVED Gimlet Pointed Wood Screws, Patented May 30, 1876.

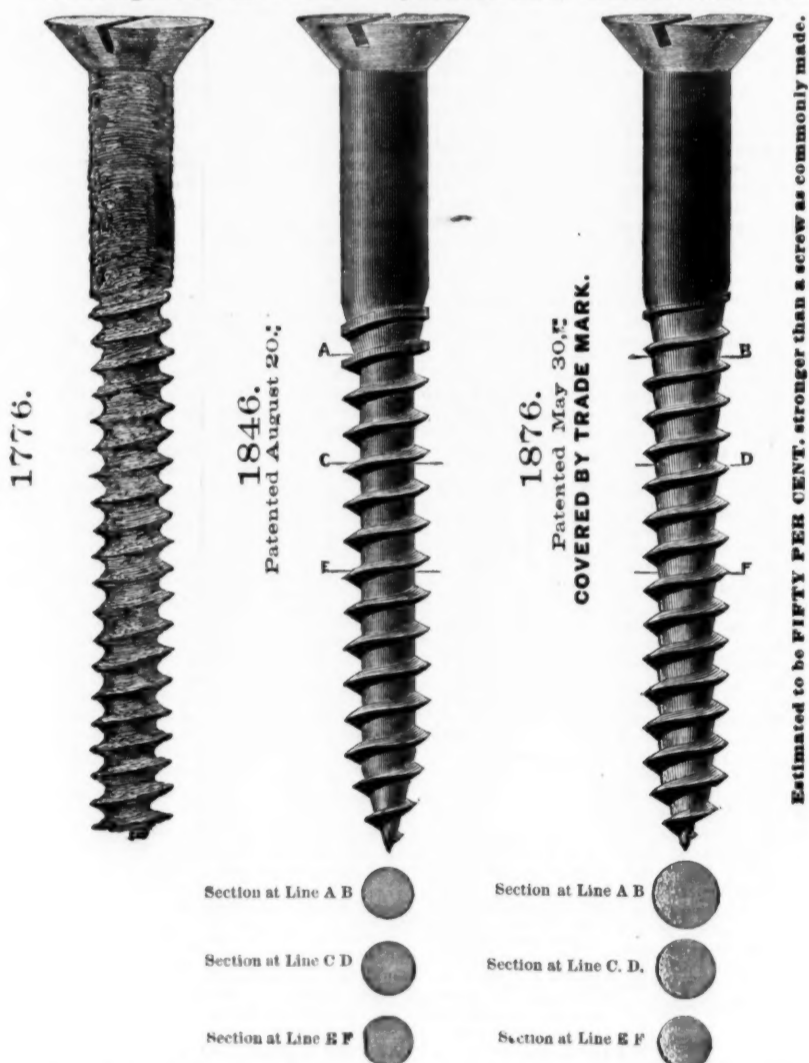


After forty years' experience we offer to the trade our Centennial Screw, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the improved article only. To introduce them, they will be sold at same price as the old style screw.

The new screws will be packed in manila colored boxes with new label covering end of box, and enlarged figures showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.



The above drawings show the progress of making screw from the old blunt point to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our new screw that not only is the sharp angle avoided, but the strength very much increased, as illustrated above. See sections at lines.

CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

Estimated to be FIFTY PER CENT. stronger than a screw as commonly made.

clearing away the debris of their recently-burned factory, preparatory to rebuilding.

NEW YORK.

A very difficult casting was made at the Eagle Iron Works, Buffalo, last week. It consisted of a drum upon which the rope for drawing coal cars up an inclined plane was to be wound. The outside diameter of the drum was 5 feet, and its face 32 inches, with a flange 2 inches wide all around the rim on the inside on both edges, and a special groove for a 1½-inch rope running over the entire face of the drum. The hub was 10 inches in diameter and 18 inches long, with a 5-inch core through the hub and 2 sets of arms extending from the hub to the rim. The entire mold for this casting was made in green sand, except those of the arms, which were made in dry-sand cores and laid in the center core. The latter was swept up into the desired shape, as was also the outside of the mold with the special groove, covering the entire face of the drum; 4500 lbs. of molten iron was required to pour the mold, and when the casting was turned out it was as perfect as if molded in dry sand or loam. To make castings of this shape and size is no great feat, as much larger drums than this one are turned out at some of the foundries in the coal regions almost every week; but the molding of such a piece in green sand is something that scarcely one founder in a hundred would undertake to do, so that this casting is probably one of the most difficult ever made in green sand in this or any other country. In the coal regions where drums of this kind are made they are always molded in loam, and in many foundries plain pulleys of even less diameter than 5 feet are often molded in loam, because they do not possess the necessary pattern or ring. In the Eagle Foundry, however, all pulleys are molded or swept up in green sand, and under the direction of their experienced foreman, Mr. John Bowen, pulleys 12 feet in diameter, with a 30 inch face, have been swept up in green sand, and as perfect a casting turned out with it as could have been made with a loam mold, at a much less expense.

The Buffalo Scale Company have received orders from the Wheeling Iron and Nail Works for a 40-ton railroad track scale with their patent combination beam which dispenses with the use of weights, the weighing being done exclusively with the poises, thus avoiding the handling of weights and the trouble frequently caused by the loss or misplacement of weights. With the combination beam the tare may be taken off when weighing, thus obviating the necessity of figuring to ascertain the weights less the tare. They have also received orders from the same company for one of their furnace charging scales, which is arranged with a patent combination beam upon which the weighing is done exclusively with the poises. It may be locked up so that the employees about the furnace cannot change the weights or know how the furnace is being charged.

The Shepard Hardware Company of Buffalo are making extensive preparations to manufacture their "sensible fluter." The roller of this fluter will be made 2½ inches in diameter, which will make it work much easier and flute much better than any of the small roller fluters. The roller fluting plate and stand will all be nickel plated, and two heaters will be furnished with each fluter, so that the fluter may be kept constantly at work without having to stop to heat the heating iron. This company are also preparing to manufacture their patent combination spider and steamer on a large scale, and will in a short time start their works on full time with a full complement of men.

The Kent Iron Co. are running their furnace and making four casts daily.

Messrs. Delamater & Co., New York city, speak of business as more active, their works giving employment to 600 men. Among their recent contracts is a wooden launch, to be fitted with double engines, for the Light House Board. The hull is building by Carl, at City Island. At the same foundry they have orders from the Pictet Artificial Ice Company, for the construction of several machines which are said to make ice at a cost not exceeding \$1 per ton.

PENNSYLVANIA.

The firm of Evans & Baird, agricultural machine manufacturers, of West Chester, are in the hands of the sheriff.—Norristown Herald.

The Plymouth furnaces at Conshohocken are both at work now and doing well.

All the furnaces in the pipe mill of the Reading Iron Co. were idle last week and undergoing repairs. A new furnace, to be known as Furnace No. 4, is being built.

The furnace of the Warwick Iron Co. week before last yielded 338½ tons of iron—the largest by far ever made by any furnace in the Schuylkill Valley.

The rail mill of the Allentown Rolling Mill started up Monday morning, the 22d ult., having received an order for 300 tons. This will keep the mill in operation one week. If additional orders are received work will continue a longer time.

The coal works of Lee & Co. at Rock Point have not been doing much for a few weeks, owing to some difficulty with their diggers. The Harmony bank employs about 50 men, and is working.

The coal works of Davidson, Green & Co., at Wampum, under the supervision of Mr. J. M. Davidson, are running steadily, and have been doing a fair business for some time past. They now employ about 50 miners, and will add more to their force as business revives.

The Lawrence Ore Co. are now operating their ore banks at Wampum, and give employment to about 60 men.

We clip the following from the Sharon Herald of the 26th ult.: For the week closing the 20th, at the Kimberly Mill, puddle, guide, and both hoop mills double turn; bar mill single. The difficulty among the nail feeders, noted last week, is settled amicably to both parties, and the nailers and feeders are clicking away just as though nothing had happened to disturb the good feeling between employer and employee. Keel Ridge Furnace is working smooth and good. At the Westernman Mill, puddle and guide mills double turn; bar, sheet and hoop mills, single turn; nail factory on four days; chain factory, all the fires working, and about one month behind their orders. Both blast furnaces doing extremely well. Slag fur-

**B. KREISCHER & SON,
New York Fire Brick &
STATEN ISLAND
CLAY RETORT WORKS,**

Established 1845.

Office, foot of Houston Street, East River,
NEW YORK.

The largest stock of Fire Brick of all shapes and
sizes on hand, and made to order at short notice.

Cupola Brick, for McKenzie Patent,
and others. Fire Mortar, Ground Brick, Clay and
Sand. Superior Kaolin for Rolling Mills and Foundries.
Stone Ware and other Fire Clay and Sand,
from my own mines at New Jersey and Staten Island,
by the cargo or otherwise.

NEWTON & CO.,

Successor to

PALMER, NEWTON & CO.,

ALBANY, N. Y., Manufacturers

FIRE BRICK

**Stove Linings,
Range and Heater Linings**

Cylinder Brick, &c., &c.

M. D. Valentine & Bro

Manufacturers of

FIRE BRICK

**And Furnace Blocks
DRAIN PIPE & LAND TILE.**

Woodbridge, - - - N. J.

A. HALL & SONS, Perth Amboy, N. J.

ESTABLISHED 1845.

HALL & SONS, Buffalo, N. Y.

ESTABLISHED 1865.

FIRE BRICK

of reliable quality for all purposes, manufactured at
the best New Jersey Fire Clay. Also, Architecture
Terra Cotta, Fire Clay, Fire Sand, Kaolin, Ground Fire
Brick and Diamond Building Brick.

Brooklyn Clay Retort

AND

FIRE BRICK WORKS.

Manufacturers of Clay Retorts, Fire Bricks, Ga
House and other Tile, Cupola Brick, &c. Dealers in
and Miners of Fire Clay and Fire Sand. Clay bank at
Burr's Creek, New Jersey. Manufacture: Van Dyke,
Elizabeth, Richards and Partition Sts., Brooklyn, N. Y.
Office No. 88 Van Dyke St.

MANHATTAN FIRE BRICK

and Enameled Clay Retort Works.

ADAM WEBER, Proprietor.

Office, 633 E. 15th St., N. Y. Clay Retorts, Kham
dled for Gas Houses; Retorts burning raw bone and
re-burning bone for Bone Black. Fire Bricks, Fire
Blocks, Cupola and Range Bricks of all shapes and sizes.
The best fire clay from my own Clay Beds at Perth
Amboy, N. J.

Watson Fire Brick Manufactory

ESTABLISHED 1836.

JOHN R. WATSON, Perth Amboy, New Jersey.

Manufacturer of

FIRE BRICK,

For Rolling Mills, Blast Furnaces, Foundries,
Gas Works, Lime Kilns, Tanneries, Boiler
and Grate Setting, Glass Works, &c.

FIRE CLAYS, FIRE SAND, AND KAOLIN FOR SALE

HENRY MAURER,

Proprietor of the

Excelsior Fire Brick & Clay

Retort Works.

Manufacturer of FIRE BRICK, HOLLOW

BRICK AND CLAY RETORTS.

WORKS, PERTH AMBOY, NEW JERSEY

Office & Depot: 418 to 422 East 23d St., N. Y.

TROY FIRE BRICK WORKS

Troy, N. Y.,

JAMES OSTRANDER & SON,

ESTABLISHED 1845.

Manufacturers of

FIRE BRICK,

Tuyeres, Tiles, Blast Furnace Blocks, etc. Miners and
Dealers in Woodbridge Fire Clay and Sand, and Staten
Island Kaolin.

Established 1864.

GARDNER BROTHERS,

MANUFACTURERS OF

STANDARD SAVAGE

Fire Brick, Tile & Furnace Blocks,

OF ALL SHAPES AND SIZES.

Clay Gas Retorts and Retort Settings,

AND

Miners and Shippers of Fire Clay.

Office: 375 Penn Ave., Pittsburgh, Pa.

WORKS: Mt. Savage Junction, Md., and Lockport, Pa.

BORGNER & O'BRIEN,

Manufacturers of

Fire Bricks,

Clay Gas Retorts,

Retort Settings,

Tiles, Blocks, &c., &c.

23d St., below Vine,

PHILADELPHIA.

Eighteen years' practical experience.

CYRUS BORGNER. WM. J. O'BRIEN

CHAS. N. BACON,

Felting & Wadding Manufactory,

Winchester, Mass.

Patent Felt Buffer Wheels for Hardware and

Cutlery Manufacturers, Brass Finishers, Nicke-

lators, Jewelers, &c. Felt for Boilers and Steam

Pipes, Harness Makers, &c. Patent Black Board

Erasers.

Office & Salesroom 22 Exchange Place Boston.



SPECIAL NOTICE.

Having learned that some of the Oxford Patent Welded Shovels first produced by us have failed to give satisfaction, owing to the imperfect manner in which they were welded, we would explain that this was owing to the defective machinery first used by us, and would state that, as soon as the defect was ascertained we employed improved machinery, and are now able to guarantee them perfectly welded and strong in every respect, and that they will give entire satisfaction.

All Oxford Shovels, Spades or Scoops that fail to hold at the weld will be replaced by us with good ones without cost to the purchaser.

Respectfully,

B. ROWLAND & CO.,

No. 27 N. Fifth Street,

PHILADELPHIA.

nance working. Stewart Furnace No. 2 working up to her average, and not gaining any on the E. & P. Railroad.

The Oil City Boiler Works are to be removed to Jamestown, N. Y.

About 420 hands are employed in the P. & R. Car Shops, Reading, who are engaged in repairing passenger and freight cars, and work eight hours a day. No new cars of any kind are being built just now. While no men are suspended or have been discharged, no new hands are employed to take the places of those who quit voluntarily and remove from Reading and engage in other occupations.

The Reading Iron Company, who employ between 700 and 800 hands in their rolling mill, tube works, nail factory, furnaces, machine shop, foundry and forge, paid out some \$30,000 last Saturday afternoon.

A change in the management of the North Lebanon Furnace, at Lebanon, is announced in the Lebanon News, based on a rumor. The present manager is Mr. Charles B. Forney, who has occupied that position during the past 25 years or more with entire acceptance, and to whose skill and energy the successful operations of the furnace is largely due. Mr. Forney was among the first managers to undertake the manufacture of iron with anthracite coal, which led to its general adoption and a subsequently increased production. Mr. Forney, it is reported, will be succeeded by Mr. Horace Brock, of Philadelphia, who will assume the management on July 1st.

The Steel Works at Beaver Falls are running to their full capacity, and are still behind with orders.

The Beaver Falls saw works are very busy, and running to their full capacity. They have received an order for a band saw 60 feet long and 9 inches wide, the largest ever made.

It is said that Ihmsen, Lake & Co., are talking of starting up their coke works at Everson, on the Mount Pleasant branch.

The Williamsport Gazette and Bulletin says: "Thus far this month the Messrs. Snyder Brothers have shipped one of their manufacture of the Parker shingle machines to L'Anse, on Lake Superior; one to Jacksonville, Florida; one to Marion, North Carolina, and one to Brazil, South America. These machines have been greatly improved by patents obtained by the manufacturers, making them much superior to the original invention."

Stokes & Parrish, Philadelphia, are now putting in at the Glamorgan Furnaces, Lewistown, one large hydraulic double-action elevator, which handles two platform cars at once, lifting ore and coal to the top of the stack. This firm has also just put in for the Standard Oil Co., New York, four double-drum hoists which handle two batches at once. They have also put up a fine hydraulic passenger elevator at the Bingham House and another one at Baltimore.

At the Black Diamond File Works, Philadelphia, G. & H. Barnett, proprietors, business is said to be unusually active. They have been working for some time past with a full force of hands, but are unable to keep pace with their orders, some being from distant points—Mexico, Brazil and European countries.

PITTSBURGH AND VICINITY.

The Great Western Gun Works, of Pittsburgh, have received an order from Norway for a lot of cartridges.

The Dexter Spring Co., at Hutton, are increasing their business very largely. They have shipped this year about 1000 Dexter springs, against 550 last year.

The coal tipple of Hays Bros., at Six Mile Ferry, was entirely destroyed by fire on Tuesday evening, the 23d ult. Loss, \$10,000. It is supposed it was struck by lightning.

A meeting of the directors of the Hawk's Nest enterprise was held in Pittsburgh week before last. Statements from the different committees and clubs were made and a resolution passed to continue the efforts of the association. New officers and a new board of directors was elected, as follows: Isaac Cline, president; J. D. Smullen, secretary, and Wm. F. Willock, treasurer. Directors, Hugo Drasher, A. D. Hamilton, John Brinkman and Thos. Martin.

The Excelsior Glass Works are enlarging their capacity. The furnace is to have larger pots, and six new shops are being got in readiness to start.

Hartley's Glass Works, Pittsburgh, are now running 10 pots on full time.

Evans, Sell & Co. propose to run 40 shops when they start their works.

The Keystone Glass Works, of Pittsburgh, are now working on a large order from South America. The present order is for 2000 dozen chimneys.

Hubbard, Bakewell & Co., ax and shovel manufacturers, Pittsburgh, are running full time, employing several hundred men and boys.

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Lawrence mill at Ironton was running double turn last week.

Sarah Furnace is making a good article of pig iron from one-fourth blue and three-fourths gray ore.

Messrs. Newton & Cox of Cleveland have just finished a new milling machine for their own use which they say is the largest in the United States. It is entirely automatic in its action, is quite unlike any other in use, and is made under patents owned by this firm. The firm have also recently added a large new planer to their plant, and have a new lathe now on the way here from the East. They are now building, in addition to other work, a large milling machine. It is a splendid specimen of plain, solid, compact, honest workmanship. They have recently gone into the manufacture of milling machines, grinding machines and cutting-off machines, and are fully prepared to fill orders for work of this class. Since January 1st they have made large numbers of their patent self-feeding reamer, the new device of which is a screw point, making better work, the makers say, than any other reamer in use. They are shipping these and their twist drills, taps and dies, to many of the best machine shops in the country.

W. S. Crane & Co., of Cleveland, report business very good, and they are putting on new workmen every day. At present they employ 49 men, making general foundry work, machinery and light castings, stable furniture, iron settees and lawn furniture, pulleys and stock food steamers. They have recently begun the manufacture of cornice machinery of late improved patterns.

It is reported that the Belfont Furnace will soon blow out, to remain idle for perhaps several months. The furnace was, so far as the hearth, bosh, &c., are concerned, never in better condition, and is working splendidly on native ore alone; she is making excellent iron at a figure never before reached here or perhaps elsewhere in the United States.

The first order at the Oviatt Agricultural Works, Hudson, is for 10 wagons and 10 thrashers.

ILLINOIS.

At a recent meeting of the North Chicago Rolling Mill stockholders the action of the directors in purchasing the Milwaukee mills was ratified. The company now propose to increase their capital stock to \$4,000,000. Of this five-eighths will represent the Chicago and three-eighths the Milwaukee mills.

KENTUCKY.

The Princess (Boyd county) Furnace was completed in the middle of May last and has been in continuous operation ever since. Mr. John Griffith, who is now blowing the furnace, reports an average daily make of 18 tons of strictly No. 1 and No. 2 pig metal, which, considering her size, is a highly satisfactory result.

The work on the boiler stack of the Norton Iron Works, Ashland, is still progressing; the stack is about 110 feet high; there is about 40 feet more to go on the top yet, making the stack 150 feet high when finished. With the exception of the stack they are ready to go to work at any time; the stack will be finished in a week or two.

Mt. Savage Furnace commenced receiving her first charcoal on Monday, and with continued fair weather will blow in on the 5th of May.

Hunnewell Furnace was to go in blast last Monday.

MISSOURI.

Joseph P. Card & Amos F. Hoffer, dealers in pig iron at St. Louis, have filed a petition in bankruptcy. The liabilities are \$162,000; assets, \$117,000. Among the creditors is J. F. Card, Cleveland, \$49,000.

TENNESSEE.

As showing an increasing interest in the Southern iron district in more scientific treatment of ores and fuels, we note the fact that Mr. W. B. Caldwell, a first-class chemist, late of Louisville, Ky., has opened a laboratory in rooms connected with the Roane Iron Company's office in Chattanooga. Mr. Caldwell is a relative and has been a student of the celebrated chemist, Prof. J. Lawrence Smith. He will be of great benefit to the ironmasters of the South, where his kind of scientific knowledge has long been needed as a factor in ironmaking.

The Chattanooga Iron Manufacturing Company blew out their furnace last week for repairs. A new hearth and bosh will be put in; all needful repairs of the machinery, hot-blast, &c., will be made as rapidly as possible, and the furnace will, if possible, be put in blast again by the middle of May.

The company have arranged with the Roane Iron Company to furnish the latter steel pig for their works, which will employ their entire capacity, and thereby for the present take the product of this furnace out of the general Southern market.

The determination about reached by the people of Cincinnati to push their Southern road through to Chattanooga will have a good effect on the iron and other industries of the South. Work can hardly begin on the line before the middle of June, and the road cannot be finished sufficiently to be available throughout its length before the beginning of 1879. All the large bridges are built; the road-bed only needs surfacing and overhauling. The iron for all but 61 miles is in hand, and the necessary ties for most of the unfinished part of the road are out. And as the portion to be finished is the only part of it which will open coal and iron mines, it will from the beginning create considerable business on its own account, as well as put much money in circulation in the Southern manufacturing country.

Hon. J. B. Killebrew, commissioner of Agriculture, Mines and Immigration, of Tennessee, is preparing an elaborate work on Tennessee mines, agriculture and manufacture. Mr. Killebrew is one of the most enlightened and laborious workers in his departments in the Union. His works have done very much to diffuse abroad just views of his State and section. He will soon begin a series of articles in *The Iron Age*, which will be of great value to those desiring accurate knowledge of the mines, manufactures, agriculture and commerce of the South generally and of Tennessee particularly.

GEORGIA.
Bartow Furnace, near Cartersville, which was blown out the latter days of January, was put in blast again on March 25th, and is now making an average of 25 tons of mill iron daily. The product will be worked up by the Vulcan Mills at Chattanooga. The ore used is brown hematite of superior quality, and the iron is highly prized for general mill purposes and by nail makers.

Rapid Transit Assured.

A dozen handsome cars for the Gilbert Elevated Railroad Company have arrived from the Pullman Palace Car Works in Detroit, and are surrounded all day long by persons who curiously observe the upholstery, running gear and other arrangements. The cars are of a pea-green color, 44 feet in length, and in shape, height and general proportions much like the regular Pullman car. The chief peculiarity is in the short leather covered seats arranged on either side, longitudinally. There are two end platforms with spring gates. The windows are of plate glass. The wheels are from the Hudson Paper Car Wheel Company, John E. Gillette, president, and among other novelties are Bissell's patent bearings, which resist the lateral motion of a car, and never heat, while Eames' patent brake will put a check on speed when necessary. Each car cost \$4000, the whole contract for 60 cars amounting to \$240,000. The passenger station at the corner of Church street and Park Place is now in course of erection, to the disgust of adjacent property owners, some of whom suffer severely, also tenants who have long leases.

The first locomotive arrived at Pier No. 1, North River, Saturday afternoon last. It was soon afterward transferred from the steamboat to the Church Street Horse Railroad, and drawn by horses to the inclined plane erected in the rear of Trinity Church. It was drawn up the plane by the power of a stationary engine, and was in position on the rails of the elevated road by 7 o'clock. The locomotive is the first of 25 to be placed on the line, and is known as No. 1. It was built at Paterson, N. J., by the Grant Locomotive Works. It is claimed that it has sufficient power to propel six cars, but it will not be required to draw or drive more than four. Its weight is 14 tons. Its cylinder is 10 inches and stroke of piston 16 inches. It is calculated that it will use from 500 to 800 pounds of coal daily. The new locomotive has eight wheels, four on each side. The two pair of end wheels are guiding or trailing wheels, and are used for steering the locomotive around the sharp curves on the road. This is the peculiar feature in its construction. The other wheels are drivers, and sustain the weight of the locomotive. After being thoroughly oiled and examined steam was gotten up and it was run up and down the road as far as Duane street twice. The machinery worked smoothly, and the adjustment of the tires to the tracks proved to be as near perfect as possible. Superintendent Van Brocklin says that the remaining locomotives will be ready within ten days and that the road will then be put in operation. A short trial trip was made on Monday with the engine and one car, but owing to some defect in the hydrant, which did not let enough water up the supply pipe for the locomotive boiler, it was not entirely satisfactory. On Tuesday a train of four cars, having on board a number of gentlemen connected with the road and others who have taken an interest in rapid transit, made a successful trip to Fifty-ninth street and back. The journey from Trinity Church to Central Park occupied only 16 minutes.

The Iron Industry at Richmond, Va.

A correspondent, writing from Richmond under date of the 13th ult., says:
I give you below a statement of the iron foundries, machine shops, rolling and nail mills in Richmond, although it does great injustice to this interest to gather its statistics in this time of depreciation and prostration. The Tredegar Works alone, before the war, employed more men than all the establishments now aggregate. Employees, 1640; machinery and tools, value, \$585,175; real estate, value, \$795,900; sales for 1877, \$2,128,650. The pig and scrap iron consumed equals 23,300 gross tons in about equal proportions. The closing months of 1877 marked a revival in the iron business of this city which has been fully maintained till this date in 1878. Nearly all the workmen in this branch belonging to our city are now employed, which could not have been said of them at any previous time since the panic. There is a cheerful spirit among our iron men which greatly helps to establish con-

fidence in the future prosperity of this branch of our industries.

As to the general condition of the iron interest throughout the State of Virginia I cannot write favorably. You know that four-fifths of our furnaces are idle. One-half of the proprietors have been ruined, and the isolated location of many of these furnaces, either as to transportation or fuel, seals their fate for the future. The more favorably located—I speak especially of charcoal furnaces—will not blow in, unless they can contract for a season's run at fully \$5 per ton above existing price.

The building of the Buchanan and Clifton Forge Railroad will probably be completed in this year, or early in 1879. This road will undoubtedly further the iron interest of the State. It will enable the furnaces on the line of the Chesapeake and Ohio Railroad, now making cold-short iron, to reach the fine neutral specular ores of Nelson county, and vice versa. These latter ore fields can be supplied with West Virginia coke, which must stimulate the building of new furnaces among them for the utilization of these valuable ores now lying comparatively useless. This railroad link unites the Chesapeake and Ohio Railroad at Covington with the James River and Kanawha Canal at Buchanan. It will be about 23 miles in length.

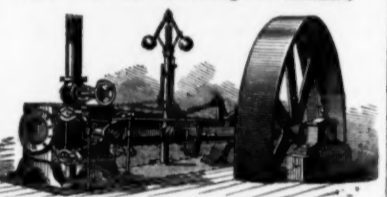
Another new gold field has just been developed. The Eldorado time is the Island of Papua, or New Guinea. The gold is found in black sand, in small scales, and also in quartz rocks. Vessels have already sailed from numerous parts of Australia to prospect these new fields. The intelligent reader will remember that this great island—some six times as large as the State of Illinois—lies between 6 and 17 degrees of south latitude, and 130 and 151 degrees of east longitude. It is 1500 miles long and its maximum width is about 400 miles. Some of its mountains are 15,000 feet high. Its native population is supposed to number a million. Gold hunters will be confronted by tattooed, fierce and warlike natives and an inhospitable climate; but myriads will be found to brave anything for gold.

Torrey's Door Springs AND Ice Cream Freezers.



P. R. DUNNE, Manufacturer, 11 No. 182 Fulton Street, New York.

Corliss Engine Builders, With Wetherill's Improvements.



Engineers, Machinists, Iron Founders and Boiler Makers.
ROBT. WETHERILL & CO. Chester Pa.



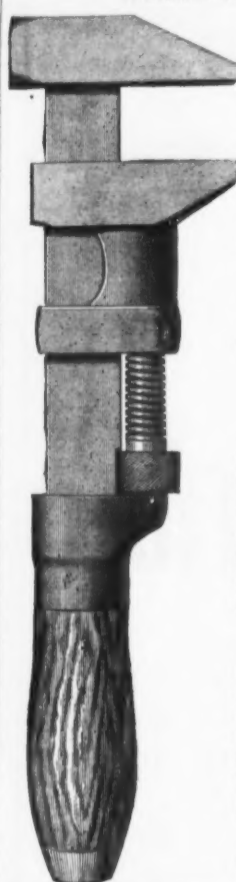
The Perfect
DOOR STOP AND HOLDER,
Will catch and hold the door every time, and no wind can blow it loose. It saves the wall, the paper, glass and slamming of doors. Liberal Discount to the Trade. Address,
SPENGLER & CO., East End, Pittsburgh, Pa.

C. F. TITCOMB,
Manufacturer of
DRY AND TARRER SHEATHING, AND
ALL KINDS OF BUILDING PAPERS.
215 Federal Street, Boston

THE STANLEY WORKS, MANUFACTURERS OF Wrought Iron Butts, Hinges AND DOOR BOLTS, Plain, Japanned, Bronzed and Plated.

We have recently purchased CROOKE & CO.'S entire stock of WROUGHT BRIGHT BUTTS, orders for which are solicited.
FACTORIES: WAREHOUSE:
New Britain, Connecticut. 79 Chambers St., New York.

STANDARD GIRARD WRENCH. WARRANTED.



FOR
STRENGTH
AND
Durability
IT HAS
NO SUPERIOR.

GUARANTEED
IN
EVERY RESPECT.

Wrought Bar, Head
and Screw.

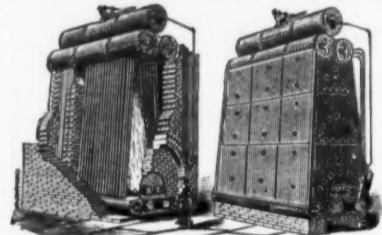
Owing to the increased demand for these justly Popular Wrenches, we are now manufacturing more than any other establishment in the world.

Our Wrench having been limited by other manufacturers, we have adopted the above Trade Mark, and will hereafter stamp all our goods.

SEND FOR
TERMS AND PRICES.

GIRARD WRENCH MFG. CO., Girard, Pa.

Send for Catalogue of the



FIRMENICH

Safety Steam Boiler.

The Boiler that made the hottest, driest and greatest quantity of Steam at the Centennial Exhibition. Tubes never require cleaning or scraping. Boilers in use for four years without getting dirty.

J. C. & F. FIRMENICH,
Office, 13 Mortimer Street, Buffalo, N. Y.

THE PRESIDENT LAWN MOWER.



The most beautiful and perfect Mower ever offered. Acknowledged in Europe and the United States to be the Lawn Mower par excellence. Easily operated, noiseless, and for beauty and evenness of work, it cannot be excelled. We warrant every machine. Don't buy any other till you see this Mower. A splendid assortment always on hand.

CARR & HOBSON,
47 Cliff St., New York.

"Bridgewater Iron Co.'s Horse Nails."

LIST PRICE, Painted and Polished.
No. 5 6 7 8 9 10
26c. 23c. 21c. 20c. 19c. 18c. per lb.

Full Assortment of above always on hand
AND FOR SALE BY

THE PARKER MILLS,
N. STETSON JR., Agent,
73 Pearl St., New York.

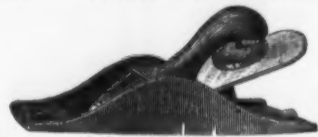
STANLEY, RULE AND LEVEL CO., IMPROVED CARPENTERS' TOOLS.

FACTORIES,

New Britain, Conn.

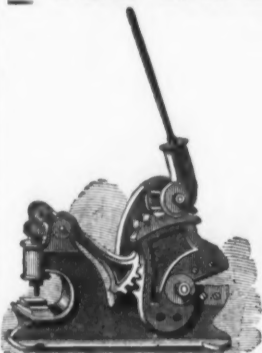
WAREHOUSES,

29 Chambers St., N. Y.



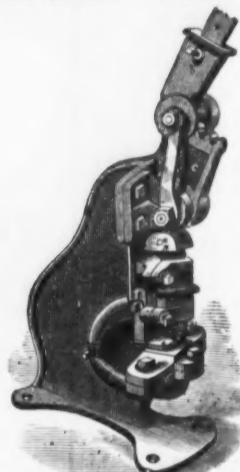
Please note removal (from 35 Chambers St.) of our warehouses.

Reduction in Price.



COMBINATION.

Punches 3/4 and under.
Cuts Bars 3/4 x 3/4 and under.
Cuts Round 3/4 and under.



Punch 3/4 to 1 1/2 in., 3/4 in. Plate. Shears for Plates & Bars.

Lyon's Patent Hand and Power DRILLS, SHEARS AND PUNCHING PRESSES.

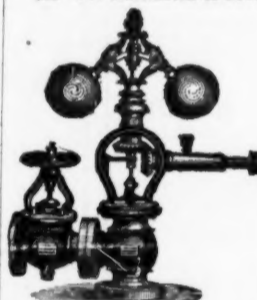
G. B. WALBRIDGE & CO., 83 Reade St., N. Y.

THE JUDSON GOVERNOR.

It is a common method to advertise Governors without cost, unless satisfactory to the customer, and then charge High Prices for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the pay, but becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Regulator of Steam Engines, but also the most durable Governor made. Parties in buying other Governors should stipulate that their durability be guaranteed, and should also take care that they do not, for much inferior Governors, pay higher prices than those shown in the accompanying list. We guarantee the Judson Governor will do all any other Governor can do, and in accuracy and durability—the main essentials—we guarantee it shall do more.

Reduced Price List, FEBRUARY 1, 1877.

For dimensions of Governor, see Illustrated Price List.



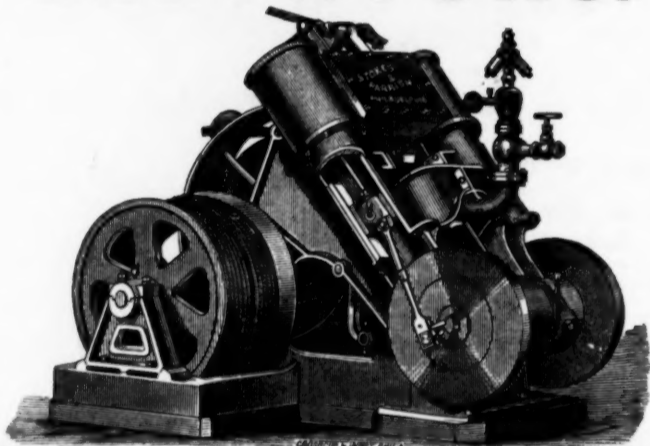
THE JUDSON PATENT

Improved Steam Governor.

No Charge for Boxing or Cartage.
JUNIOUS JUDSON & SON, Rochester, N. Y.

Size, Inch.	Plain.	Brilliant.	Brilliant, Extra.	Stop Valve.
1/2	\$16.00	\$18.00	\$1.00
3/4	18.00	20.00	1.00
1	20.00	22.00	1.00
1 1/4	23.00	26.00	1.25	6.00
1 3/4	26.00	30.00	1.50	8.00
2	31.00	35.00	1.75	10.00
2 1/4	36.00	41.00	2.25	12.00
2 3/4	40.00	45.00	2.50	14.00
3	45.00	51.00	2.75	16.00
3 1/4	50.00	57.00	3.25	18.00
3 3/4	55.00	62.00	3.50	20.00
4	60.00	68.00	3.75	22.00
4 1/4	65.00	74.00	4.00	24.00
4 3/4	70.00	80.00	4.25	26.00
5	75.00	86.00	4.50	28.00
5 1/4	80.00	92.00	4.75	30.00
5 3/4	85.00	98.00	5.00	32.00
6	90.00	104.00	5.25	34.00
6 1/4	95.00	110.00	5.50	36.00
6 3/4	100.00	116.00	5.75	38.00
7	105.00	122.00	6.00	40.00
7 1/4	110.00	128.00	6.25	42.00
7 3/4	115.00	134.00	6.50	44.00
8	120.00	140.00	6.75	46.00
8 1/4	125.00	146.00	7.00	48.00
8 3/4	130.00	152.00	7.25	50.00
9	135.00	158.00	7.50	52.00
9 1/4	140.00	164.00	7.75	54.00
9 3/4	145.00	170.00	8.00	56.00
10	150.00	176.00	8.25	58.00

ELEVATORS.



INDEPENDENT STEAM ELEVATOR ENGINE.

Hydraulic Elevators to run from City Pressure.
Condensed Air and Hydraulic Elevators operated by Steam Pump.
Independent Steam Elevators. Belt Power Elevators.
Portable Hoisting Machines.

All kinds of Hoisting Machinery a specialty.

STOKES & PARRISH, 3001 Chestnut St., Phila.

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87 Chambers & 69 Reade Sts., New York.

Hardware Manufacturers' Warehouse.

OFFICE AND WAREHOUSE OF

UNION HARDWARE CO.,

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Anti-Friction Barn Door Hangers,

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Shears of all kinds.

WALDEN KNIFE CO.,

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N. Y. ANTI-FRICTION METAL CO.'S

HOWARD,

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P. LOWENTHAUT & CO.,

Dividers, Callipers, &c.

Pocket Cutlery.

Bladed Metals.

Razor Straps.

Spring Balances.

Dividers, Callipers, &c.

Tennessee Land Titles.

There has been a great deal said and written about the defective character of titles to much of the land in Tennessee, particularly in the mountain districts where most of the mineral deposits are found. It is quite true that the titles by which professed owners hold a good deal of this territory are not valid, and that much of it is nominally owned by mere squatters who never had a legal right to a foot of it. There never has been a systematic survey made of any portion of Tennessee, except West Tennessee and a small area around Chattanooga, known as the Ocoee District. The lands were originally disposed of by State authority, and the business was done in the most crude and careless fashion. The bottom, cove, and valley lands were taken by actual settlers, for purposes of cultivation. The metes and bounds of plantations were ascertained, and these parcels of land have either descended or been conveyed regularly for two or three generations. Any one buying a farm in Tennessee is as certain to get a good title as he would if buying in any other State, provided he exercises ordinary caution as to mortgages, judgment liens, &c.

But the original titles to the mountain and hill lands were not obtained with a view to settlement. Forty years ago these lands were not considered to be of any value, except as hunting grounds and cattle ranges. Their worth as mineral lands was not dreamed of by the men who entered them by the thousands of acres, on speculation, and at nominal prices. They were taken in immense tracts by citizens of the Carolinas, who, not attaching much importance to their purchases, were naturally not very particular or exact as to the manner in which the surveys were performed on which their grants were founded. These grants lapped one upon the other, as the same surveyors did not by any means make all the surveys within any given territory, and none of these artists were very particular in establishing corner stones, witness trees and other monuments to designate where they had traced lines and made angles. There seems to have been great activity in the business of entering these mountain lands from 1834 to 1840. The taxes on these tracts were not paid in many instances, and poor people who had squatted on them bid them off at tax sales, acquiring some sort of title. Then the Supreme Court of the State decided that holding absolutely undisturbed possession of realty for a term of seven years under color of title, made such color of title a fee simple. That decision, rendered about 1856, quieted both possession and title in and to hundreds of thousands of acres.

Each successive Legislature has tried its hand at devising some measure whereby the titles to these bodies of land in Tennessee to which the paper titles were confused could be ascertained and rendered safe and certain. These efforts have been failures, and the people have been thrown upon the courts for relief. And the relief, though long delayed in some instances, has been certain wherever properly sought. There is absolutely no necessity for failure to obtain good titles to any tract of valuable timber or mineral lands in Tennessee, though such title cannot be had by purchase from the first person an investor meets who claims to be the owner of a given parcel. The proper way for those desiring to purchase lands in Tennessee to proceed is to secure the services of a competent and responsible agent, and give him power to make surveys, secure abstracts, and do all things necessary to be done to get to "the bottom grant," or at least to a sure legal tenure.

Tracts in single bodies covering 50,000 acres have been purchased by coal and iron companies, and perfect titles secured to every foot of them. But the purchasers had the wisdom to expend some labor, pains and money to make assurance sure. And even adding these necessary expenditures to the purchase money the companies referred to bought the cheapest mineral lands of the kind on the Continent. There is no foundation for the assertion made in interested quarters that all the best mineral lands of Tennessee are either in litigation or are liable to be on account of defects and collisions and duplicity of titles. These cases are the exceptions. Nearly all the most valuable mines of coal and iron, and nearly all the land where these minerals are likely to be found are covered by absolutely good titles, and those not so covered can be reduced to legal and certain ownership at comparatively small expense. Many large tracts of the best mineral lands, full of coal, iron, valuable marble and building stone, &c., near lines of railway, can be purchased in the State of Tennessee, including all expense for clearing up titles, at prices which in Northern mineral regions would be considered merely nominal. The ridiculous cheapness of these lands has deterred investors from putting their money in them on speculation, their very cheapness conveying the belief that they were intrinsically worthless, or that there can be no certainty in the titles. In point of fact both conclusions are exactly the reverse of true.

The New Steamers for the Brazilian Trade.

The steamship City of Rio de Janeiro, the first vessel of the new and only American line to Brazil, is open to the inspection of the public, at Pier No. 17, East River. She was built by John Roach & Son, at Chester, Pennsylvania, and is a magnificent vessel. Her dimensions are: Length over all, 370 feet; beam, 39 feet; depth of hold from base line to top of the spar deck, 31 feet 6 inches; burden, 3500 tons; mean draft, 21 feet. Her engine is of the compound type, the low pressure cylinder being 75 inches in diameter, and the high pressure, 42½ inches. The pistons have a stroke of 5 feet. Her boilers are six in number, and the ordinary steam pressure is 80 pounds. There is a surface condenser, provided with 4000 feet composition tubing and independent air and circulation pumps. The vessel is provided with two sets of steering gear, one worked by steam and the other by hand-power. The latter is meant to be used only in case the former should be disabled. On the main deck are several large ice houses and an ice-

Established 1838.

THE HART, BLIVEN & MEAD MFG. CO.,

MANUFACTURERS OF

GENERAL HARDWARE.

107 Chambers and 91 Reade Sts.,
NEW YORK.

Factories at Kensington, Connecticut.

Our complete Catalogue for 1878, containing all the goods we manufacture, is now ready for distribution, free of charge, to our customers.

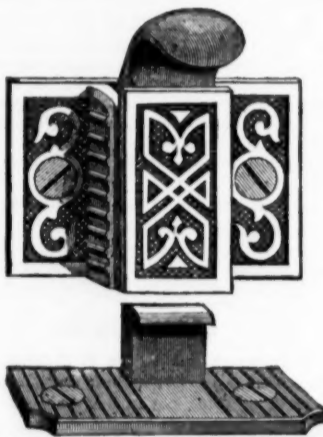
Shelf Brackets.

Full Size Cut of Nos. 80, 85
and 87, 4x6.No. 80, Figured Enameled. No. 85,
Enameled and Gilt. No. 87,
Nickel Plated.

Connell's Engraved Hand Bells.

Full Size Cut of Nos. 600 and 700.
No. 600, Polished Bell Metal. No. 700, Nickel-Plated.

Sash Lock and Lift.

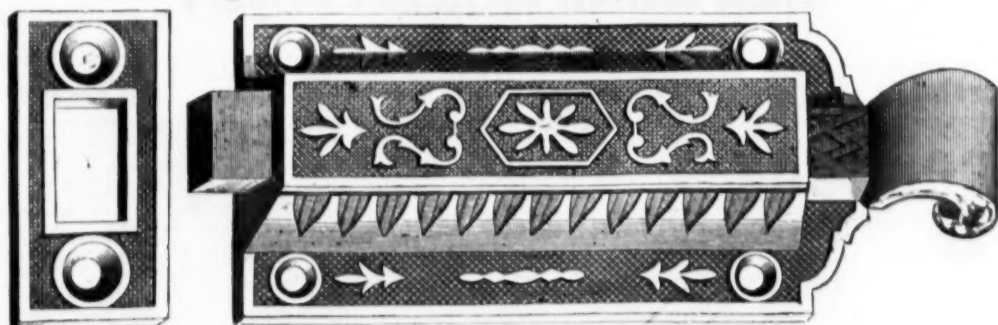
Full Size Cut of Nos. 95 and 095.
No. 95, Figured Enameled. No. 095, Solid
Bronze Metal.

Burglar Proof Sash Fasteners.

The Cheapest and Best ever offered to the trade.

Full Size Cut of Nos. 261, 263 and 0263. Patented.
SHOWING SASH FASTENER LOCKED.
No. 261, Figured Enameled. No. 263, Nickel-Plated.
No. 0263, Solid Bronze Metal.

Figured Enameled Bottom Bolts.



Full Size Cut of No. 10. Patented.

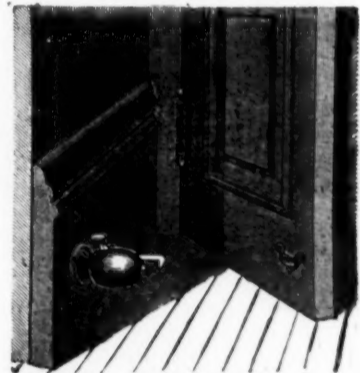
making machine having a capacity of 5000 pounds a day.

The appointments of the saloons and state rooms of the vessel are perfect. The floors of the saloons are of hard wood, and are covered with soft crimson Wilton carpet, figured with dark green foliage. Paths are marked out with fine cocoa "runners." The carpets and the "runners" are kept down with large headed brass nails, whose shafts are sunk and fit tightly into brass cylinders. These nails can be drawn up without injury to the fabric, and are used because it is intended to remove warm floor covering while the steamer is in the hot climate of Brazil. Crimson lambrequins edged with deep fringe, depend from the cornices of the saloon windows. The woodwork in the saloons is of an artistic and elaborate character, six kinds of wood being used—maple, black walnut, French walnut, bird's-eye maple and satinwood. The state rooms are perfectly appointed, nothing being absent from their furnishing that would be provided in the chambers of a first-class hotel. In each room are two berths. The top berth is made after the manner of the sleeping cases in the Pullman palace cars, so that, if a passenger engages a state room for himself alone, it can be turned up, and its under part being made of handsome dark walnut, nicely carved, and well polished, it becomes an embellishment to the apartment. The berths are draped with crimson lambrequins and lace curtains. The floors of the rooms are covered with body Brussels carpet, the color and design of the fabric in no two apartments being alike. There is electric communication from each room to the steward's pantry, where there is a large annunciator. The state-rooms are 46 in number, providing accommodations for 100 cabin passengers. There are also accommodations for 100 steerage passengers. The saloon table service is of china and nickel silver, decorated with the name of the steamship in a garter, on one side of which is the American flag, and on the other the Brazilian flag. The bowls and pitchers in the state rooms are also of china, decorated in the same way.

The arrangements for increasing or lowering the temperature of the saloons are admirable. Pipes, which run along the floors on each side of the apartments, may either be filled with steam or cold air, according as the steamship is in a cool climate or in the tropics. These are prevented from disfiguring the apartments by being inclosed in bronzed iron lattice-work. The precautions for the prevention or extinguishment of fires are admirable. In the engine room is a heat register so delicately arranged that the slightest increase of temperature in any apartment with which it is connected affects it. Every room in the vessel is brought into communication with this, and it is said that whenever a lamp is lighted in one of them it records the increased heat resulting therefrom. Two donkey engines are provided for use only in case of fire.

The Perfect Door Stop and Holder.

The door stop and holder, manufactured by Spengler & Co., East End, Pittsburgh, of which we give an illustration, is a valuable and useful invention. As will be seen from the cut, it consists of the ordinary door stop with a rubber or velvet tip, on the upper side of which a slot is sawed and a latch inserted, the attachment of the latch being such that it is always down ready to catch. To the door a catch is attached, and no mat-



ter at what angle the door opens, the latch will catch and hold and no wind can blow it loose. At the same time it saves the plastered wall and the wall paper from being injured by the key or knob. It prevents the breaking of glass in vestibule doors, holds the door securely open for sweeping, ventilation or other purposes, and prevents that worst abomination, the slamming of doors. Messrs. Spengler & Co. are now offering them to the trade. These door stops are made in three styles, the prices of which will be found in our trade report under the heading of "General Hardware."

The following are interesting facts concerning the Fall River mills, affected by the defalcations of Hathaway & Chase. The Border City Mills were incorporated in 1872, with a capital of \$1,000,000, all paid in, divided into 10,000 shares at \$100 each. The corporation manufactured print cloths, running two mills, with 1884 looms and 76,203 spindles, employing about 950 hands, and producing 10,200 pieces weekly. Their financial statement a year ago showed assets of \$2,020,438 and liabilities of \$1,693,383. The Sagamore Mill had a capital of \$250,000, and at the last report assets of \$229,492 and liabilities of \$673,610. A statement of the Union Mills Company shows a valuation of the mill property of \$988,120.20. The amount of regular notes outstanding against the corporation is \$433,661.53. The amount of irregular and void notes remaining unpaid is \$508,407.77; the whole amount of irregular notes issued was \$510,407.77. The total amount of regular and irregular, or fraudulent notes is \$942,069.30. The amount of bills payable, in addition to the notes, as far as known, will probably not exceed \$50,000.

The New Bedford Copper Company have rolled a sheet of yellow metal 63½ feet surface and 4-16 inch thick, to turn the air cylinder of the new ferry-boat now building at Portland, Me., for the Boston, Revere Beach and Lynn Railroad.

EXPORTS		Quant.	Value.
Danish West Indies.			
Quin. Value.			
Grindstones, 5		5	\$50
Hdw., 38		38	343
Hamburg.			
Ag. imp., pkgs.	42	1,794	
Clocks, cs.	63	768	
Mach'y, cs.	36	2,654	
C'ge mtl., pgs.	7	334	
Spelter, slabs, 207		4,336	
Pumps, cs.	5	55	
Hdw., cs.	64	2,767	
Sew. mach., cs.	21	633	
Belting, bales.	15	3,328	
Copper, cs.	36	7,600	
Antwerp.			
Rifles, cs.	2	680	
Hdw., cs.	5	250	
Ag. imp., pkgs.	3	350	
Spring, cs.	2	915	
S' draper, case	1	100	
Bremen.			
Ag. imp., pkgs.	43	2,133	
Mf. iron, pkgs.	20	1,400	
Hdw., cs.	15	725	
Mach'y, cs.	15	725	
Wringers, pgs.	13	150	
Mf. iron, pkgs.	50	1,600	
Rotterdam.			
Pumps, pkgs.	11	700	
Hdw., cs.	86	4,440	
Ag. imp., pkgs.	95	4,104	
Mach'y, cs.	7	433	
Clocks, bxs.	11	100	
Mf. iron, pkgs.	24	216	
Hull.			
Hdw., cs.	183	4,768	
Ag. imp., pkgs.	157	4,845	
Mf. iron, pkgs.	15	180	
Mach'y, cs.	7	4,400	
Clocks, cs.	5	100	
C'ge mtl., pgs.	11	500	
Wheels, bds.	137	2,600	
London.			
Ag. imp., pkgs.	42	2,448	
Pumps, pkgs.	11	612	
Sew. mach., cs.	20	7,133	
Mach'y, cs.	48	5,665	
Hdw., cs.	34	535	
Clocks, cs.	12	1,200	
C'ge mtl., pgs.	39	898	
Nails, cs.	44	895	
Liverpool.			
C'ge mtl., pgs.	5	154	
Ag. imp., pkgs.	235	5,029	
Wringers, pgs.	24	764	
Lamps, pgs.	34	1,170	
Pumps, pkgs.	11	800	
Pistols, cs.	11	800	
Mach'y, cs.	19	1,865	
Mf. iron, pkgs.	12	2,000	
Hdw., cs.	129	5,720	
Clocks, cs.	6	390	
Burners, cs.	3	69	
Iron, bds.	22	1,100	
Cutlery, cs.	8	600	
Glasgow.			
Ag. imp., pkgs.	6	72	
Havre.			
Ag. imp., pkgs.	85	8,536	
Cádiz.			
C'ridges, cs.	100	2,400	
Clocks, cs.	2	9	
Hdw., cs.	7	235	
Mf. iron, pkgs.	2	180	
Porto Rico.			
Lamps, pkgs.	3	50	
Mf. iron, pkgs.	8	155	
Barrows, cs.	2	75	
Hdw., cs.	7	1,082	
Sew. mach., cs.	21	496	
Pumps, pkgs.	4	85	
Nails, cs.	200	568	
Ag. imp., pkgs.	172	2,751	
Mach'y, cs.	18	2,133	
Carriage, cs.	1	805	
British North American Colonies.			
Tinware, cs.	31	203	
Coal, tons.	376	1,350	
Hdw., cs.	11	206	
British West Indies.			
Ag. imp., pkgs.	3	91	
Lamps, pkgs.	10	58	
Hdw., cs.	26	390	
C'ge mtl., pgs.	8	72	
Mf. iron, pkgs.	4	980	
Mf. iron, pkgs.	1	196	
Tinware, cs.	26	306	
Nails, cs.	60	190	
British Honduras.			
Hdw., cs.	21	314	
Mf. iron, pkgs.	13	44	
Nails, cs.	9	91	
Arms, cs.	1	100	
Zinc, pkgs.	3	91	
British Australia.			
Lamps, pkgs.	27	376	
Imports.			
Hardware.			
Ainwick, G.			
Guns, cs.	3		
Baker Hermann & Co.			
Arms, cs.	2		
Baldwin Bros.			
Gun barrels, cs.	4		
Burkholder W. C.			
Packages, 4			
Curtis R. J.			
Chain & hdw., pkgs.	1		
Charles R. P.			
Grindstones, 1000			
Carey Samuel.			
Grindstones, 1000			
Ely & Wray.			
Cases, 1			
Fraser P. A. & Co.			
Misc., pkgs.	1		
Howell E. A.			
Wire rope, coils, 2			
Hildick A. H.			
Chains, 1			
Chains, cs.	8		
Shears, cs.	1		
Keuffel & Esser.			
Cases, 1			
Luhauich M.			
Whetstones, cs.	1		
Mali H.			
Cases, 1			
Mason J. W. & Co.			
Wire rope, coils, 1			
McCoy & Co.			
Cases, 12			
Moore's J. P. Sons.			
Guns, cs.	2		
Gun caps, cs.	2		
Arms, cs.	7		
Phelps Dodge & Co.			
Ladies, cs.	1		
Bothschild, L.			
Cases, 3			
Schroeder & Daly.			
Guns, cs.	1		
Misc., pkgs.	2		
Schuyler Hartley			
Graham.			
Guns, cs.	6		
Sellers W. B. Jr.			
Cutlery, cs.	1		
Squires H. P.			
Guns, cs.	1		
Tillotson L. G. & Co.			
Wire, lots, 1			
Wiebusch & Hilger Hdw.			
Co.			
Hardware and Cutlery.			
Whitney A. R.			
Flues, 177			

FOREIGN.		Quant.	Value.
FRANCE.			
(Monteur des Interests Matérielles.)			
PARIS, April 14, 1878.—Metals.—Business, to some extent held in check by the disquieting political outlook in general, has been unusually quiet during the week in consequence of the hoisterous weather. Toward the close it is picking up a little. Copper.—The lack of animation in the metal markets and the unfavorable statistical position of this particular metal have kept Copper depressed. We quote Chili Bars deliverable at Havre, 171.25 francs the 100 kilos; Common do., 167.50; Ingots, 171.50; English Trough Cakes, 178.25; do., Best Selected, 180, and pure Corocoro, 172.50. Havre is weak and quiet for all brands Chili Bars, 171.25; 172.50; good current do., 170, and Lots and Urmeneta, 165 @ 167.50, Paris conditions. Marseilles is steady at the following quotations: Spanish, in slabs, 155; Red Tokat, 160; Small Refined Ingots, 175; Bids, 205; Rheathing, 195, and Yellow Metal Sheathing, 190. Tin.—Confidence is slow in returning to this metal, and in all the metal markets of Europe it is giving signs of great weakness, including those of France. We quote the same here, deliverable at Havre and Paris, 181 francs for Banca; Billiton, 173; Straits, 171.25; Australian, 171.25, and English at Havre or Rouen, 170. Marseilles quotes Straits, 165 @ 170; Billiton, 170; English, 180, and Banca, 180 francs the 100 kilos. Lead has, from all appearances, not yet touched bottom. We quote French, German and Belgian, 44.50, deliverable here, and Spanish, 44.50; English, 45.50. We quote a Soft Spanish, 44 @ 45 francs. Marseilles reports a quiet and weak market and quotes as follows: First Fusion Soft, 41.50 @ 42 francs the 100 kilos; Second do., 40.50; Shes, 40.50; Pipe, 40, and Shot, 40.50. Spelter.—Spelter has become a little steadier. We quote the same, deliverable here, 42.25, and at Havre, 42.50 francs the 100 kilos. Sheet Zinc is quoted 61.65 francs, less 3/4 at Marseilles. Old Refined, in slabs, 43 @ 44 francs. Havre quotes Silesian, 40. Iron.—According to the official statistical Pig Iron production in France has been 1,524,266 tons in 1877, against 1,453,112 in 1876; that of Wrought Iron, 747,437 tons, against 733,494; of Sheet Iron, 125,361 tons, against 115,126; and, finally, that of Steel 248,948 tons in 1877, against 240,403 in 1876. Futures deliverable in the immediate future sold early in the year have been pretty well taken up, delivered, having been called for faster than usual, as the stocks in the hands of dealers had been exhausted, and as the demand for available iron continues unabated, purchases are again forced into the market. Makers avail themselves of this propitious circumstance in order to screw up prices. Iron for supports of floors now easily brings 19 francs, and the works are making their pretensions. In the Ardennes the demand for merchant iron is languishing. The hardware and bolt works are doing better; the nail makers on the contrary still complain. The iron works of the Haute-Marne are suffering from the same dullness. Sheet iron has declined to such a low point that makers are indifferent as to the filling of orders at rates so very unremunerative. Pig iron is moving off slowly; in Central France the blast furnaces are making sacrifices in order to prevent suspending operations. Sheet iron, on the contrary, is looking up. At the recent adjudications which came off at West, Iron and Steel sheets for transportation were taken by the Ausim Company at 25 francs; the Terre-Noire Company took Sheet Steel at 23.50, and the Creusot some at 34.75. Firmly and the Terre-Noire are the only works in the Central district showing some activity. In the Northern department prices are maintained with some firmness, and thin Sheet Iron has sold in large lots at 30 francs. Merchant iron is tolerably firm at West, Iron and Steel sheets for transportation were taken by the Ausim and Moselle "Affluents." Pig iron ranges between 61 and 62 francs; the tendency still remains a firm one. Hardly anything is doing in second fusion Pig Iron. Coal.—There has been a slightly improved demand for pure steam coal, but the stocks in general are still too large, and thus an improvement in value is prevented.			
BELGIUM.			
(Revue Industrielle.)			
BRUSSELS, April 14, 1878.—Iron.—The exchange here and the local market well attended without leaving too much business during the week. The State railroad lines have not come forward with a great many adjudications lately, so far as rails and rolling stock are concerned, but a good many minor articles of railway material have been put under tender. On the 24th inst. the iron railroad depot at Courtrai, alluded to in former reviews of ours, will come up for adjudication. The import of iron ore and scrap into this country during the first two months of the current year shows an increase of 856,000 francs over the corresponding period of last year, and that of Pig Iron a decrease of 62,000 francs. The price of iron ore has increased during the same period of time, while that of Wrought Iron and all manufactures has decreased 450,000 francs. In the Charleroi region iron industry has of late been slackening a little. Coal.—There is no great activity in the situation, and prices are weak. The shipments of Coal from Belgium have been 523,000 tons during the first two months of the year, against 409,000 tons during the corresponding period of 1877; the import has been 113,000 tons against 107,000 in 1877.			
GERMANY.			
(Borser-Halle.)			
HAMBURG, April 13, 1878.—Metals.—The many uncertainties which still keep the general political horizon clouded are a decided impediment to a genuine revival in business, and both dealers and consumers remain in an expectant attitude, limiting their purchases to urgent requirements. Speculation is still dormant, notwithstanding the extreme ease in money and the spring trade at this advanced season again proving to be a disappointment. Copper continues to suffer from general causes, just enumerated, and special ones connected with its abundance at the leading centers. Berlin is quiet and quotes as follows: Good qualities English and Australian, 72 @ 77 marks the 50 kilos, and Mansfield, 72 @ 77.50. We are dull here, and quote Drontheim, 78 @ 79 marks; American, 85; English, 74 @ 75; English Sheathing, 81 @ 82, and ditto, 82 @ 83; Metal Sheathing, 65 @ 66. Stettin remains quiet; they quote the various sorts, 77.50. Tin.—Business in this metal is of a restricted nature. Berlin quotes: Banca, 73 @ 73.50 marks the 50 kilos, and English, 69 @ 69.50. We are dull in this market, and quote: Banca, 74 @ 75 marks, and English, 74 @ 75. Lead is still tending downward. Berlin is weak, and quotes as follows: Saxonian, 18 @ 18.50 marks the 50 kilos, while here we still maintain the following quotations: English Pig, 21 @ 21.50; ditto Sheet, 21.50 @ 22; German Pig, 20 @ 20.50; Spanish, 22.50 @ 23; English White Lead, 31.25 @ 32, and ditto, 31.25 @ 31.50. Stettin unaltered. Berlin quotes good qualities Silesian, 19.50 @ 20 marks the 50 kilos; Breslau quotes as follows: Common do., 18.50 @ 19; W. H. 17.50, and Godulla, 18 marks. We are steady here as follows: Silesian, to arrive, 19.50; ditto Sheet Zinc, 24.50 @ 25; ditto Vieille Montagne, 25 @ 25.50; ditto for Sheathing of vessels, 26.50; Zinc White, 26 @ 28; Light Gray ditto, 25.50, and Dark ditto, 25.50.			
HOLLAND.			
(Rijk & Vloerboer.)			
ROTTERDAM, April 16, 1878.—Tin.—The market has been slightly looking up, there being a little increase in the demand. Banca Tin to be delivered from the late sale, after selling at 40 guilders the 50 kilos, has improved to 40.25, and Billiton, after bringing 38 and 38.125, has suddenly risen to 38.375. Lead.—Of the P. C. B. Banca, 200 Bids sold at 10 guilders the 50 kilos. Stolberg may be had at 10.25.			

Special Notices.

JENNINGS'S COMBINATION DISCOUNT TABLES.

(Published by the author.)

This Book contains 1500 tables for single and combination discounts, such as 17 1/2%, 45%, 40 1/2%, 15 1/2%, 25 1/2%, 33 1/2%, 35 1/2%, 37 1/2%, 40 1/2%, 42 1/2%, 44 1/2%, 46 1/2%, 48 1/2%, 50%, &c., &c., which are so arranged as to be found without loss of time, and by their use either the Discount or Net on any amount of dollars and cents, from a penny to one million dollars, can be ascertained in a few seconds entirely by Addition. Just the thing for making or proving invoices, finding Net Value of goods bought or sold, and comparing different Discounts, thereby saving time, blunders and headwork.

(A copy can be examined in "The Iron Age" Exhibit at the Paris Exposition.)

OPINIONS.

SHEFFIELD, ENGLAND, March 22, 1878.

We have tested your book and find it the most simple and complete yet published. It will be most valuable to us in getting at net costs, trying invoices, &c., and we think that every business house in the States and every house here that is at all engaged in the American trade should have a copy. We are glad to bear such testimony to its great value.

WM. MARPLES & SONS.

POUGHKEEPSIE, N. Y., February 23, 1878.

Mr. S. H. Jennings, Dear Sir:—Enclosed please find \$5.00, for which send us by mail one copy of Jennings's Combination Discount Table, as noticed in "The Iron Age" of this week. Trusting it is what we have wanted many, many times, we are Yours respectfully,

ELSWORTH & DUDLEY.

POUGHKEEPSIE, N. Y., April 5, 1878.

Mr. S. H. Jennings, Dear Sir:—Your Discount Table has come safely to hand, and the writer has tested it pretty thoroughly and very satisfactorily. Particularly do we find it useful in getting cost on goods for skimming them. Trusting you may find many who will express the same opinion, we are Yours respectfully,

ELSWORTH & DUDLEY.

It will be mailed, postpaid, to any address, on receipt of the price, \$5. Currency may be sent by mail at my risk.

S. H. JENNINGS, Deep River, Conn.

S. H. JENNINGS, Deep River, Conn., U. S. A.,

Offers his services to parties in any FOREIGN COUNTRY except Great Britain, who may desire to establish, build up, or increase a trade in American Hardware, Agricultural Implements, Machinery, and Miscellaneous Goods, as EXPORT FACTOR, at a low rate of commission. Correspondence solicited. He has had three years' experience as Purchasing Agent for

Messrs. WM. MARPLES & SONS, Sheffield and London, England.

Jobs done business throughout Great Britain, and to whom he would with pleasure refer. By arrangement with them he will represent no other firm having a house or branch house in Great Britain, which includes England, Ireland, Scotland and Wales. He buys direct from manufacturers, and only for export, thus securing lowest possible prices. He will attend to all matters this side of the water, including Purchases, Shipments, Remittances, &c., and has facilities in New York City for securing prompt shipments at most favorable rates of freight. Manufacturers of goods suitable for Foreign Trade are invited to send him their circulars, price catalogues, and quote "hard pan" prices for export, which will be considered confidential.

VALUABLE CAR WORKS AT ASSIGNEES' SALE.

The Middletown Car Works, at Middletown, Pa., will be sold to the highest bidder, public sale, upon the premises, at Middletown, Pa., on the 21st day of May, 1878, at 2 o'clock. This valuable property is erected upon leasehold estate for 99 years, immediately adjoining the Pennsylvania Railroad Company's shops, and is well adapted for the repair and improvement of cars of all descriptions, with all the necessary outbuildings for an establishment of this character, and with complete machinery, all in excellent working order. It is believed to be one of the best locations in the country for business of this character, and the sale will be peremptory. The attention of purchasers is earnestly invited to this rare opportunity for a profitable investment, and any persons desiring to have the property will be shown it by the undersigned.

SEYMOUR RAYMOND, GEORGE ETTER, Assignees.

To Manufacturers and Jobbers of Hardware, Cutlery, &c.

Manufacturers and Jobbers, having surplus stocks or goods that from any cause are unsaleable upon which they wish to realize, or assignees who have stocks to dispose of, will find a cash purchaser by communicating with

W. M. CALDWELL, Dealer in Job and Auction Lots of Hardware, Cutlery, &c., 103 Chambers St., New York.

DROP FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings

in quantities to order at reasonable rates.

HERMANN BOKER & CO., Proprietors, 101 & 103 Duane St., N. Y.

Notice of Removal.

20 CHAMBERS ST., NEW YORK, Jan. 1, 1878.

I beg to advise that I have removed from Nos. 101 and 103 Duane street, to 20 Chambers street, where samples can be inspected and communications addressed.

Yours respectfully,

ASLINE WARD, Agent for Geo. Wostenholm & Son, "Limited," Washington Works, Sheffield, and Fredk Ward & Co., 37 George St., Sheffield. P. O. Box No. 1631, New York.

REMOVAL.

NEW YORK, May 1st, 1878.

JENNINGS BROS., Manufacturers of the

Japanese Paper Ware,

WILL OCCUPY 51 MURRAY STREET, with a full line of Samples, including their improved STANDARD PAIL, with Patent Bottom and Metallic Binding. Reduced Price Lists now ready. Trade supplied.

Special Notices.

The Sherman Process Company, PROPRIETORS OF THE "SHERMAN" PATENTS, Is now ready to Issue Licenses to use the said Process under a Royalty.

The Process is used to great profit in the Puddling Furnace, Martin-Siemens Furnace, Bessemer Converter, Crucible, and for Gray Iron Castings.

The use of the Process does not involve any changes in the furnaces or in the present manner of working them, nor does it increase the labor, but on the contrary saves material, fuel, labor and time.

The chemicals used are not expensive, their cost not exceeding 25 cents per ton of product, and the charge for royalty is placed at a low price so as to bring the Process into general use.

By the use of this Process a large percentage of the cheaper grades of iron and steels can be made into a good merchantable product.

Iron which have been found impossible to use either alone or in mixture with other irons are now being profitably used by means of this Process.

It improves the working of both poor and good iron or steels, a better product being obtained by its use than is possible without it. It makes the molten metal more fluid and the product more sound, homogeneous and ductile.

It makes less skull and scrap and less waste in the finished product.

For castings that are to be tapped and have threads cut upon them, it allows a close, strong iron to be used, leaving it soft for the tool to readily cut.

By the use of this Process in the Bessemer or Martin-Siemens furnace, good steel rails can be made from a mixture of iron 30 to 60 of old iron rails and the balance good stock. Thousands of tons of steel rails made by this Process, as above are now being used in France.

The Process will be demonstrated without expense, at the works of parties applying, and the amount of royalty to be charged for its use will be furnished upon application to

The Sherman Process Co., No. 9 Pemberton Square, BOSTON, MASS.

See page 17 of The Iron Age, of Oct. 25, 1877.

SPECIAL NOTICE.

The undersigned offer their services as agents to American Producers of Metals. They represent foreign brands of

Zinc, Russia Iron, Hoop Iron, Window Glass, Cutlery and Guns.

LOUIS WINDMULLER & ROELKER, 90 Reade Street, N. Y.

Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy. A practical man with means is wanted to join a practical man who is already well established. Address CAR WHEEL FOUNDRY, P. O. Box 134, Selma, Alabama.

TO MANUFACTURERS OF HARDWARE SPECIALTIES.

To Let, to make on Royalty, a Hardware Article (patented) of assured Sale and Profit. This is addressed only to parties having ample resources, knowledge and prestige in the trade. For full particulars address

S. R. BARTLETT, Concord, Mass.

Just Issued.

IRON MAKING AND COAL MINING IN PENNSYLVANIA.

By JAMES M. SWANK, Secretary American Iron and Steel Association.

This work, compiled at the request of the Pennsylvania Board of Centennial Managers, is an important contribution to the historical literature of mining and metallurgy in America. It traces the origin and development of iron making and coal mining in this country, and contains a large amount of historical data, compiled chiefly from original sources, and verified by the most careful research.

Price, bound in Cloth, \$2.00.

Orders should be sent to the author, at the office of the American Iron and Steel Association, No. 25 South Fourth Street, Philadelphia, Pa.

For Sale.

Large Punch and Shears, N. Y. Steam Engine Co. make; two small Punches; 16x1 1/2 feet Planer; number of Drills and a lot of tools suitable for architectural ironwork; Steam Engines and Boilers of all sizes at JOHN CARROLL, 266, 268 & 270 Front St., N. Y.

For Sale, To Let or Exchange

For other Property (Western preferred), Stock or Interest in an established Business,

On very reasonable terms, one of the finest pieces of property in the country for Foundry or general Manufacturing purposes, and consists of the following substantial brick buildings, situated corner Vall Ave. and North St., Troy, N. Y., viz., Moulding room, 132x74 ft., with large three-story building attached, 174x52 ft. The distance between floors and ceilings on each story is respectively 14, 12 and 10 ft., and are now used as mounting, store, sample and office rooms. Attached also is a two-story building, 90x45 ft., with engine and boiler rooms. On same grounds are sheds, barns and large yard. Attached to the property also are engine and boiler, main lines of shafting, elevators, &c. The property fronts on three streets. It will be sold, rented or exchanged, in part or together, and at very low price. Address

A. G. PATTON, Columbus, O. Or W. H. HOLLISTER, Jr., Troy, N. Y.

Special Notices.

W. GARNER, General Merchant,

Mouldsworth, near Chester, England,

Supplies nearly every class of Goods, including all kinds of

Agricultural Machinery, Domestic Machines, SEWING MACHINES And Artificial Manures.

W. GARNER is open to represent any Foreign Manufacturers in England for the sale of their manufactures of whatever nature or kind. Having a wide and well established connection in the Provinces, could introduce some American, German and French products to mutual advantage.

W. GARNER is also open to buy any kind of Goods on commission, and ship them to any part of the world. Manufacturers or others desiring his assistance will please address (with full particulars in English) as above.

AUSTRALIA.

AMERICAN HARDWARE CO., No. 9 WILLIAM STREET, MELBOURNE, AUSTRALIA.

Solicit correspondence with American manufacturers (desirous of representation in the Australian Colonies). Consignments will have prompt attention. References furnished.

LEHIGH UNIVERSITY Tuition Free.

CIVIL, MECHANICAL AND MINING ENGINEERING; CHEMISTRY AND METALLURGY; FULL CLASSICAL INSTRUCTION; FRENCH AND GERMAN; ENGLISH LITERATURE; INTERNATIONAL AND CONSTITUTIONAL LAW; PSYCHOLOGY AND CRIMINAL EVIDENCES. For Register address

The REV. JOHN M. LEAVITT, D. D., President, Bethlehem, Penn.

The Bullard Machine Co., "Limited,"

have retired from business. Settlement of all accounts will be made by

Treasurer, 23 Nassau Street, who is authorized to sign "in liquidation." Our patrons are referred to the following notice.

BULLARD MACHINE CO., Limited.

I will continue the business in Machinery Tools, Wood-working Machinery and Steam Engines, both new and second-hand, at the old stand of the late Bullard Machine Co., Limited, No. 14 Dey St. E. P. BULLARD.

TO HARDWARE MANUFACTURERS.—A middle-aged man who is acquainted with jobbers in this and other cities, would like to arrange with manufacturers to introduce specialties. Has been a hardware salesman 15 years, either on salary or commission. Best of references. Address A. G., Office of The Iron Age, 83 Reade St., New York.

Rolling Mill For Rent.

Near Railroad and Canal and leading markets. Capacity, 10 tons per day. Address ROLLING MILL, Office of The Iron Age, 83 Reade St., New York

Second-Hand Tools and Engines.

One Mason Milling Machine, heavy; four Brainerd Milling Machines; one extra heavy Milling Machine; one spindle Drill, Pratt & Whitney Co.; one spindle Drill, Pratt & Whitney Co.; one Tapping Machine, Pratt & Whitney Co.; one 16 in. 3 ft. Planer, Pratt & Whitney Co.; one 8 in. Gould Shaper; one 8 in. N. Y. Steam Engine Co. Shaper; one 24 in. x 17 ft. Shafting Lathe; one 24 in. x 16 ft. Shafting Lathe; one 30 in. x 14 ft. Lincoln Planer.

E. P. BULLARD, Successor to BULLARD MACHINE CO., Limited, 14 Dey St., New York.

AUCTION NOTICE FOR 1878.

Bissell & Welles,

WHOLESALE AUCTIONEERS AND COMMISSION MERCHANTS, No. 15 Murray Street, New York,

Would solicit from manufacturers and importers consignments of Hardware, Cutlery and House Furnishing Goods for their Spring Auction Sales, and are prepared to extend every facility. Having had long experience and a thorough knowledge of all classes of hardware, and our acquaintance being extensive, our sales are largely attended by city and country buyers, making them unusually successful. We refer to the entire hardware trade of New York.

WANTED.—A thoroughly competent business man, with \$20,000 to \$30,000 capital, to take an active managing interest in a large and profitable manufacturing concern. There is sufficient capital in the business at present, and therefore, money not so much an object as to get a responsible party with large experience in the iron trade and first-class business ability interested. To such a man this is a rare opportunity of investing his money and services profitably. Address in confidence, with references, for particulars, "MANUFACTURER," TORONTO, CAN

Strong Sauce Pans, without Covers.									
Nos.	20	22	24	26	28	30	32	34	36
Quarts.	10	11	12	13	14	15	16	17	18
Per doz.	\$10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75	20.00
Patent Stove Sauce Pans, with Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Patent Stove Sauce Pans, without Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Patent Stove Kettles, with Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Patent Stove Kettles, without Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Camp Kettles.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Retinned, per lb.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Boiler.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Sauce Pan Covers, Plain.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Oval Tea Kettle, Coal Hod.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Oyster Stands, Complete.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Retinned, per doz. Stands.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
For Plates and Covers, Stamped Ware.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Wood Handled Britannia Ladies.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Flesh Forks.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Inches.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Two-prong, per doz.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Three-prong, per doz.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
PLAIN STAMPED WARE.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Discount 10 per cent.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Oval Rimmed Boiler Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Steamer Bottoms.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Pint.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Per gross.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Quart.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Per gross.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Cake Box Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Common Pot Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Inches.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Coffee Pot Covers, Plain.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Inches.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Coffee Pot Covers, Rimmed.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Inches.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Tea Kettle Breaders, Rimmed Covers.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Inches.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Round Tea Pot Breaders and Covers, Plain, Rimmed.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Round Tea Pot Breaders and Covers, Spun, Hinged and Rimmed.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Pint.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Per gross.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Steamer Bottoms.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Inches.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Per gross.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Square Plates, Full Sheet.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Scalloped Pie Plates.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Inches.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50
Letttered Plates, 5 in.									
Nos.	6	7	8	9	10	11	12	13	14
Quarts.	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Per doz.	\$11.50	12.75	14.00	15.25	16.50	17.75	19.00	20.25	21.50

as well as of the Trent Works in North Lincolnshire. He was greatly respected, and had long been known by the title of the "gentleman ironmaster" in token of his universal urbanity and kindness.

ENGLISH AND AMERICAN TUBES.

This subject forms the substance of a very interesting and important letter addressed by Mr. George Westinghouse, Jr., to the *Ironmonger*, which had quoted what now appears to have been a private letter from that gentleman which had appeared in a Pittsburgh contemporary of yours. The following is Mr. Westinghouse's letter and its accompanying comparative list:

"Sir: My attention has been called by the representative of a large manufacturer of wrought-iron pipes to an article in your paper of April 8th, containing an extract from a private letter not intended for publication. The article is calculated to throw doubt on my statement, and I therefore ask you to insert this letter and the enclosed table of English and American price lists with the appended notes. Up to the date of the letter from which the extract was made I had not been offered more than 40 per cent. discount from the list, making the price for 3/4 steam pipe 72-10 cents, but have since been offered a larger discount, bringing the price considerably below that figure. The representative of the tube manufacturer above referred to quite agreed with me as to the almost worthless character of English-made gas pipes, but claimed his company made steam pipes that were tested to 700 pounds per square inch, and gave me the list of prices in the enclosed table and the amount of discount he would allow, this discount being 2 1/2 per cent. less than offered by the American manufacturer.

"A comparison of the prices and discounts in the lists will show you that I might have written in much stronger terms, especially as regards all pipe above 1 inch in diameter.

"Respectfully yours,

"GEO. WESTINGHOUSE, JR."

The list enclosed by Mr. Westinghouse is thus set out:

English and American Iron Tubes.—Comparative Prices.

English List.				American List.				
Description.	English List.			Description.	American List.			
	Internal Diam.	Price per Foot in Pence.	Price per Ft. in Cts.		Internal Diam.	Price per Ft. in Cts.	Price per Foot in Pence.	
Butt Welded.	Inch.			Butt Welded.	Inch.			
	1 1/2	2	.04	1 1/2	2	.06	3	
	2	3	.05	2	3	.07	3 1/2	
	3	4	.06	3	4	.08	4	
	4	5	.07	4	5	.09	4 1/2	
	5	6	.08	5	6	.10	5	
	6	7	.09	6	7	.11	5 1/2	
	7	8	.10	7	8	.12	6	
	8	9	.11	8	9	.13	6 1/2	
	9	10	.12	9	10	.14	7	
Lap Welded.				Lap Welded.				
	1 1/2	11	.23	1 1/2	11	.18	11	
	2	14	.28	2	12	.22	11	
	3	18	.36				15 1/2	
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
	4	21	.42					
	5	24	.48					
	6	27	.54					
	7	30	.60					
	8	33	.66					
	9	36	.72					
Butt Welded.				Lap Welded.				
	1 1/2	11	.23		1 1/2	11	.18	11
	2	14	.28		2	12	.22	11
	3	18	.36					15 1/2
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Butt Welded.				Lap Welded.				
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Butt Welded.				Lap Welded.				
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	8	33	.66					
	9	36	.72					
Butt Welded.		</						

HOBART'S TACKS

MANUFACTURED BY
DUNBAR, HOBART & WHIDDEN,
ESTABLISHED 1810.

Office and Salesroom, 116 Chambers Street, New York. Factory, South Abington, Mass.



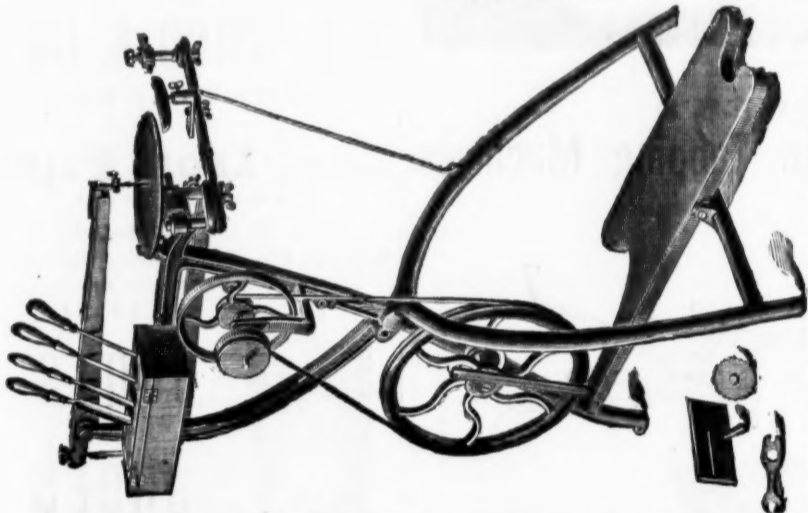
Any Kind of Wire Nails made to order from Description, or Samples.

American and Swedes Iron Tacks,

Tinned, Leathered and Large Head Carpet Tacks, Finishing Nails, Black and Tinned Trunk Nails, Miners' Copper, Gimp, Lace and Brush Tacks, Hungarian, Chair, Cigar Box and Barrel Nails, Glaziers' Points, Iron, Steel, Copper and Zinc Shoe Nails, Patent Improved Brass Shoe Nails, Heel and Toe Plates, Steel Shanks, and Fancy Head Nails, Silver or Japanned Lining and Saddle Nails, A full assortment always on hand at salesrooms, for immediate delivery if required. Old and Irregular Sizes made to order or cut from sample at short notice. Send for Price List.

LESTER SAW.

The New Lester Saw is made of Iron, with all the working parts of Steel, and contains all known Improvements to this Date.

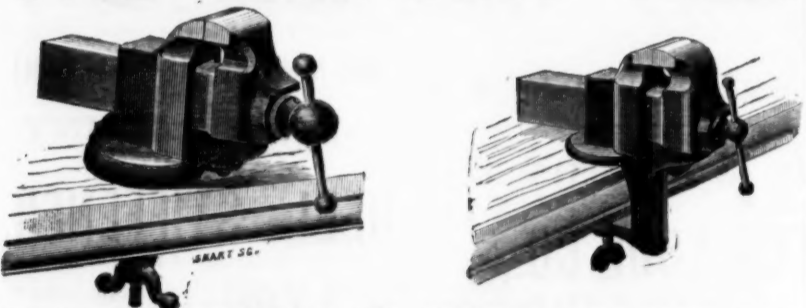


It is handsomely painted red and green, with red stripes, and presents a beautiful appearance. Those parts which are not painted are either polished or japanned. We warrant the Saw to be just as herein stated, and we know it will give entire satisfaction, being a more expensive machine than those which we formerly sold for \$25. It consists of—
1st.—A SCROLL SAW, with Fitting Table for inlaid work; arms 18 inches in the clear; clamps which will hold saws of any length or width, and face them in four different directions; cutting lumber from 1/4 inch to 1 inch in thickness; speed, 100 strokes per minute.
2d.—A CIRCULAR SAW, 24 inches in diameter, which will cut lumber one-half inch and less; with an iron table, 4 by 6 inches.
3d.—A DRILLING ATTACHMENT, with six Stubbs' Steel Drills, of various sizes, for wood or iron work.
4th.—An EMERY WHEEL, with wide and narrow rim.
5th.—A TURNING LATHE, with iron ways and rest, steel centres, and three best steel turning tools; length of ways, 15 inches; distance between centres, 6 inches; swing, 3 inches; length of slide-rest, 4 1/2 inches; number of revolutions per minute, 250.
Also, with each machine, six Saw Blades, a Wrench, Screw-driver, extra Belt, and two sheets of Designs, with a nice box for the small tools, and a box for the whole machine. It is taken apart when shipped, and packed in a box, but the working parts are all left in place, and the frame is put together again by a single bolt.

PRICE FOR EVERYTHING ABOVE NAMED, \$8.00.
The same, without the Lathe and Circular Saw, \$6.00.
When desired, we furnish with the Lathe a very nice Drill Chuck, for working metal, and a Tail Stock, with a screw centre, for \$2 extra. The machine alone weighs 47 lbs., and, with the box, 70 lbs.
We also keep a full stock of Tools and Supplies in the Bracket Sawing line.

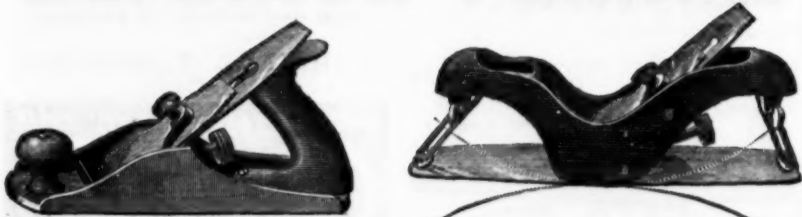
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THE SIMPSON VISE.



WITH RAPID ADJUSTMENT AND HARDENED STEEL-FACED JAWS.
Simple, Strong, Durable.

DEFIANCE PLANES.



A finely tempered cutter of Firth's first quality English Steel in every one, whether the list price is 75¢ or \$7.00. Sample orders solicited. Send for catalogue to

BAILEY WRINGING MACHINE CO., Sole Agents,
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G. W. Bradley's Edge Tools.

Butchers' Cleavers,
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MARTIN DOSCHER, Agent, 96 Chambers Street, N. Y.

NATIONAL Horse Nail Co.

MANUFACTURERS OF
FINISHED
(BRIGHT OR BLUED)



These nails are made of the best brands of NORWAY IRON, and are guaranteed to be equal to any in the market.

NATIONAL HORSE NAIL CO.,
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HORACE DURRELL & CO., Agents,
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BEST BRANDS SOLD.			
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	\$9.50 per doz.		
E	LIPPINCOTT'S,	X	
	\$9 per doz.		
S	DIAMOND,	E	
	\$8 per doz. Cash, 30 days.		
A	X	E	S

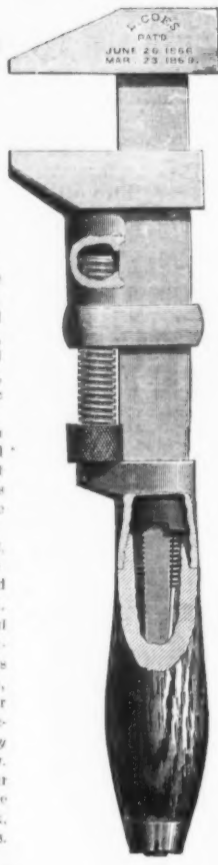
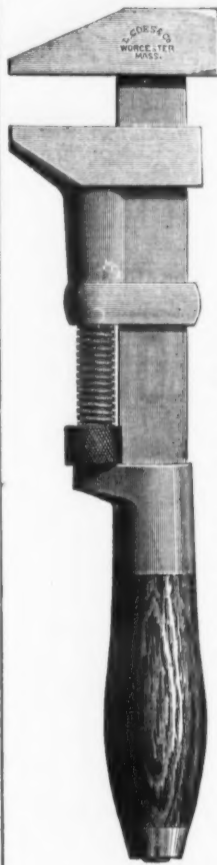
Made in PRUSSIA by
HUBBARD, BAKWELL & CO.
Sold by
Everyone who keeps good Hardware.

L. COES' SCREW WRENCHES.

Genuine Improved Patent

Manufactured by

L. COES & CO.,
Worcester, Mass.



Established in 1839.
We invite the particular attention of the trade to our New Straight Bar Wrench, *applied* full size of the larger part of the so called "reinforced or jog bar." Also our enlarged jaw, made with ribs on the inside, having a full bearing on the front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes, which were at once closely imitated and sold as the *Genuine* Wrench by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped:—

"L. COES & CO."

Warehouse, 97 Chambers St., & 81 Reade St., N. Y.
HORACE DURRELL & CO., Sole Agents.



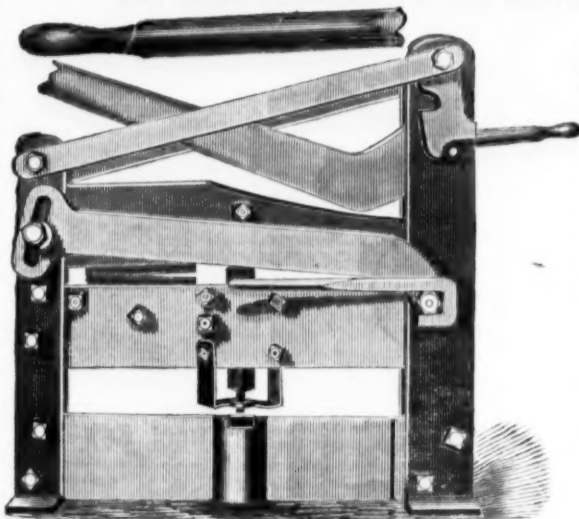
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WM. HASSALL,
Manufacturer of
American and French
Wire Nails

Molding and Finishing Nails, with or without heads. Brush Makers', Upholsterers', Cigar Box, Basket, Chair and Undertakers' Finishing Nails a specialty. Shoe Nails of Brass and Iron. Bright Iron Rivets. Brass and Iron Escutcheon Pins, with flat, round and fancy heads, all sizes on hand and to order.

OFFICE AND WORKS: Nos. 63 & 65 Elizabeth Street, New York.

PATENT WROUGHT IRON SHEAR,

With Punch Attachment, for Iron and Plow Steel.



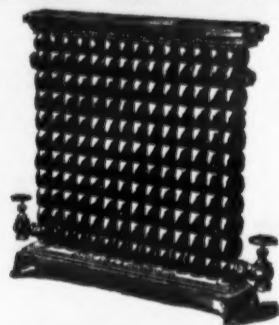
Will cut iron 4x3/4, 1 1/2 round and square. Will punch half inch hole through half inch iron. Weighs 340 lbs.; without punch attachment, 190 lbs. Occupies a space 8x30 in. when not in use, and when in use further space merely sufficient to bring down the lever. It is built so exceedingly strong that two men cannot injure it. Price, \$40.00, at Cleveland; without Punch Attachment, \$25.00. Liberal discount to the trade. Shears for special work made promptly to order.

CLEVELAND HARDWARE CO.,

Manufacturers of
Wrought Iron Wagon Hardware, Iron Cutters, Punches and Sterling Barn Door Hangers.

CLEVELAND, OHIO.

SNOW'S PATENT CAST IRON RADIATOR.



The only Perfect Circulating Radiator in the market
Address the manufacturers.

EATON, COLE & BURNHAM CO.,
58 John St., New York,
or Thomas Hart, 712 Filbert St., Philadelphia Pa.

NEW IRON TACKLE BLOCKS.

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Galvanized Malleable Iron Shell and Sheave, Steel Hooks, Steel Pins.
Superior to Wood Blocks on account of not Checking
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The Strongest, Lightest, Easiest Running and most Durable Block yet produced.

Send for sample and price list of same to



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BLOCKS.

The Penfield Block Works,



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WROUGHT IRON BLOCKS
FOR ROPE OR CHAIN.

All sizes constantly on hand for Rope from $\frac{1}{4}$ in. to 2 $\frac{1}{2}$ diam., and for Chain 3-16 to $\frac{3}{8}$ in. diam.



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CHAMPION
HOG RINGER
RINGS and HOLDER.

Only double Ring ever
invented. The only
Ring that will effectually
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rooting. No sharp
points in the ring.

Ringers, 75c. Rings, 50c. 100. Holders, 75c. Huskers, 15c.

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EAGLE BILL
CORN HUSKER

Is the best Husker in the
market. Farmers say it
is the best. Use no other.



BROWN'S
HOG AND P G
RINGER and RING
Only single Ring in
the market that closes
on the outside of the
nose. No sharp points
in the nose to keep it
so.

McNab & Harlin Mfg. Co.,

MANUFACTURERS OF

BRASS COCKS AND VALVES

For STEAM, WATER

and GAS.

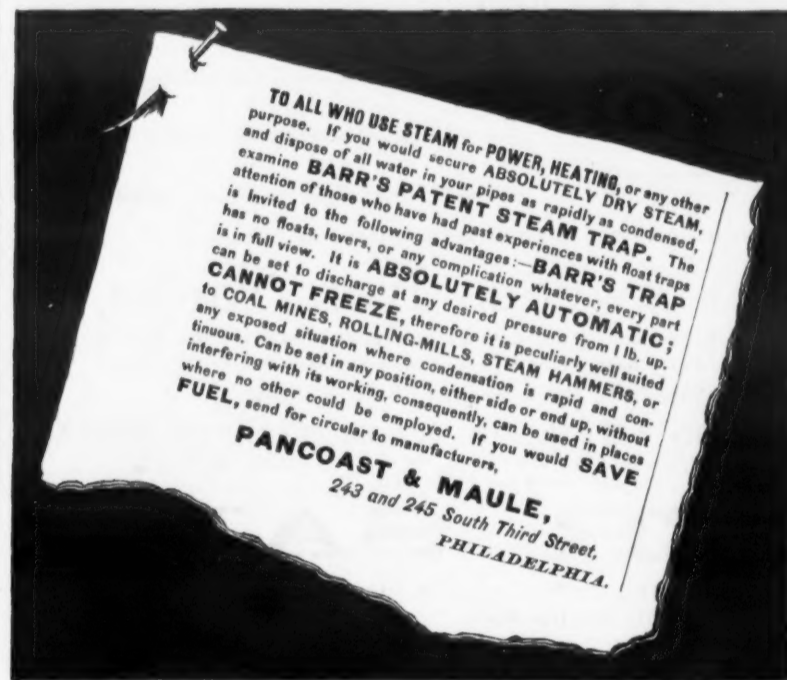
Iron Pipe and Fittings, Plain and Galvanized.

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SCHLENKER'S
Screw Cutting and Nut Tapping Machines.

This engraving represents a No. 5 $\frac{1}{2}$ Machine, and cuts from $\frac{3}{8}$ to 2 inches.

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THE HOWARD IRON WORKS, Buffalo, N. Y.

The only GENUINE D. R. BARTON Tools

ARE MADE BY

THE D. R. BARTON TOOL CO.,

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THE CONNECTICUT VALLEY MFG. CO.,

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GERMAN GIMLET BITS, etc.

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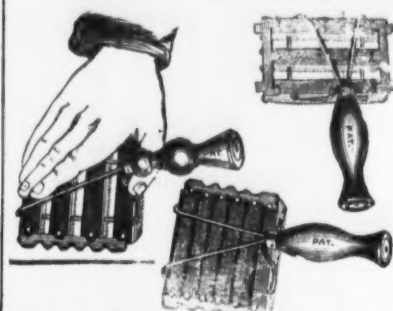
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WM. S. CARR & CO.

Sole Manufacture of



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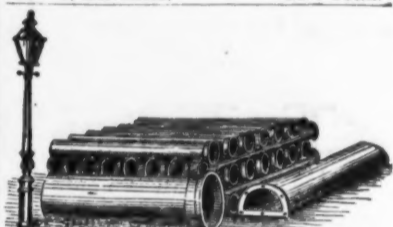
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Closets,

PUMPS, CABINET WOOD WORK, &c.

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R. D. WOOD & CO.,

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Manufacturers of

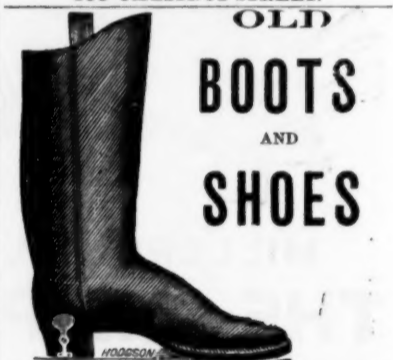
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Hassall William, 63 & 65 Elizabeth, N. Y. 25
Wire Ropes, Iron and Steel, Makers of.
Hazard Mfg. Co., Wilkesbarre, Pa. 4
Roebeling's John A., Sons, Trenton, N. J. 4
Wooden Ware.
Adams F. F. & Co., Erie, Pa. 33
Wrenches, Manufacturers of.
Jemis & Callahan & Tool Co., Springfield, Mass. 34
Coe L. & Co., Worcester, Mass. 34
Girard & French Mfg. Co., Girard, Pa. 11
Wrenches.
Adams F. F. & Co., Erie, Pa. 33
Alexander F. J., Boston, Mass. 11
Bailey Wringing Machine Co., 59 Chambers, N. Y. 11
Metropolitan Washing Machine Co., 32 Cortlandt, N. Y. 8
Cincinnati Cincinnati, O. 8
The American Machine Co., Philadelphia, Pa. 36

ZUCKER & LEVETT, NICKEL PLATERS' SUPPLIES.

Estimates for Complete Outfits Furnished.
639 & 641 West 51st Street, New York.

SABIN'S LEVER DOOR SPRING.

*Patented in the U. S.
Feb. 1, 1876, and Aug. 1, 1876.*



Sabin Mfg. Co.
MONTPELIER, VT.

March 27, 1876, and Sept. 23, 1876.
Patented in Canada,

The most efficient and simple Door Spring ever made. Will readily close the heaviest outside doors, as well as get the maximum pressure upon the door when closed, and a constantly decreasing pressure as the door is opened. The tension of the spring is readily adjusted to any power required, and there is no attachment of any kind to the door. Are specially adapted for railroad depots, offices, stores and public buildings, as they can instantly be made inoperative if desired, without detaching any part of it. No chains or straps to break or wear out. We use a long coiled spring made of the best cast steel, and tempered, and are practically indestructible. Send for circulars and price list.

Fig. 1.
See descriptive advertisement
next week.



Fig. 2.



Send for catalogue.

To the Hardware Trade

A General assortment of

HARDWARE

For the country trade constantly on hand.
JOHN I. BROWER & SON, 288 Greenwich Street, New York.
JOWETT'S HORSE RASPS, 14, 15 and 16 IN.

Agents for Maharay's & Tire Shrinker, Heller's Rasps, Clark's New Pat. Sash Fasteners. Send for Circulars.

ENTERPRISE MANUFACTURING COMPANY of PA.

Patented Hardware Manufacturers and Iron Founders.

Third and Dauphin Streets,

PHILADELPHIA.

SPECIALTIES:

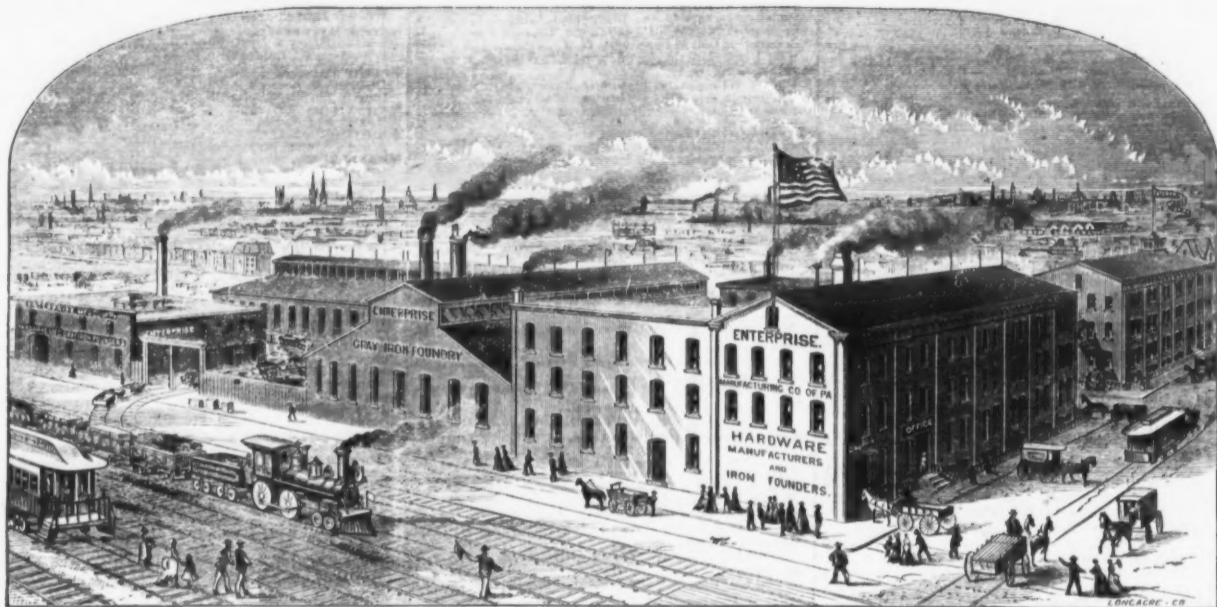
American Coffee, Drug
and Spice Mills,

Combined Sausage Stuffer, Fruit,
Lard and Jelly Presses.

Champion Dried Beef Shaver.

Bung Hole Borers.

Coffee Roasters,
&c., &c.



VIEW OF WORKS.

SPECIALTIES:

Enterprise Patent Cold Handle
Double Pointed

SMOOTHING
and POLISHING
IRONS.

Patent Self-Measuring Faucet.
Champion Tobacco, Root and Herb
Cutters.

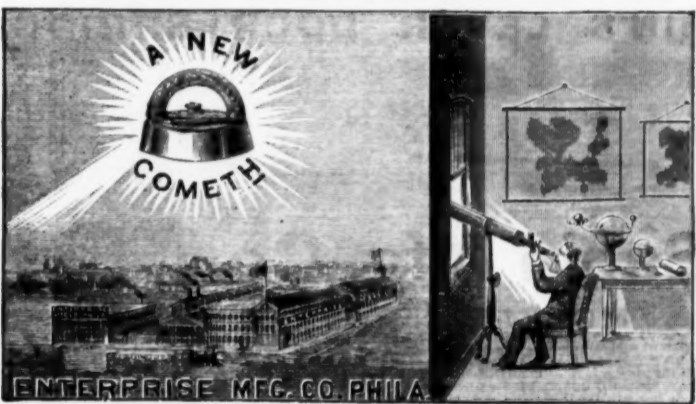
Self-Weighing Cheese Knife.
&c., &c.



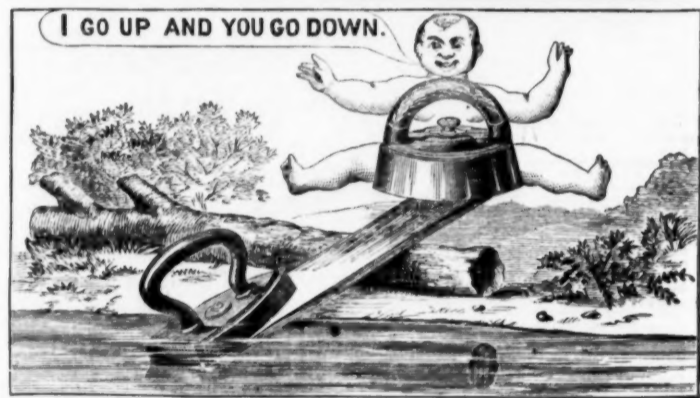
Chinese Polisher.



Enterprise Patent "Star" Iron.



MRS. M. FLORENCE POTTS.
The Inventor of the Cold Handle
Sad Iron.



Champion Dried Beef Shaver.
Guaranteed the Best in the Market.

ENTERPRISE Cold Handle Double Pointed Smoothing, Polishing and Girls' Irons.

(MRS. POTTS' PATENT.)

They have a cold detachable Wood Handle. They are lined with non-conducting cement, and require no holder or cloth. They do not burn the hand. They are the best in use.

SEND FOR CATALOGUE.



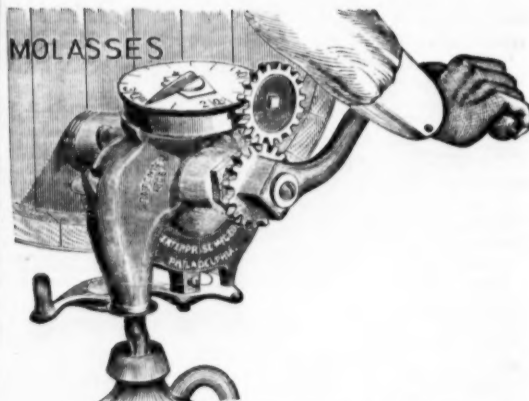
Price—Nickel-plated, \$2.50; Plain Polished, \$2.00.

Three Irons, one Handle and Stand constitute a Set.

FOR SALE BY THE HARDWARE TRADE.

They heat quicker than any other Iron. They retain the heat longer. They are double pointed. They iron both ways. They are cheap.

SEND FOR CATALOGUE.



Patent Self-Measuring Faucet.
Over 150,000 in Actual Use.

SEND FOR ILLUSTRATED CATALOGUE.

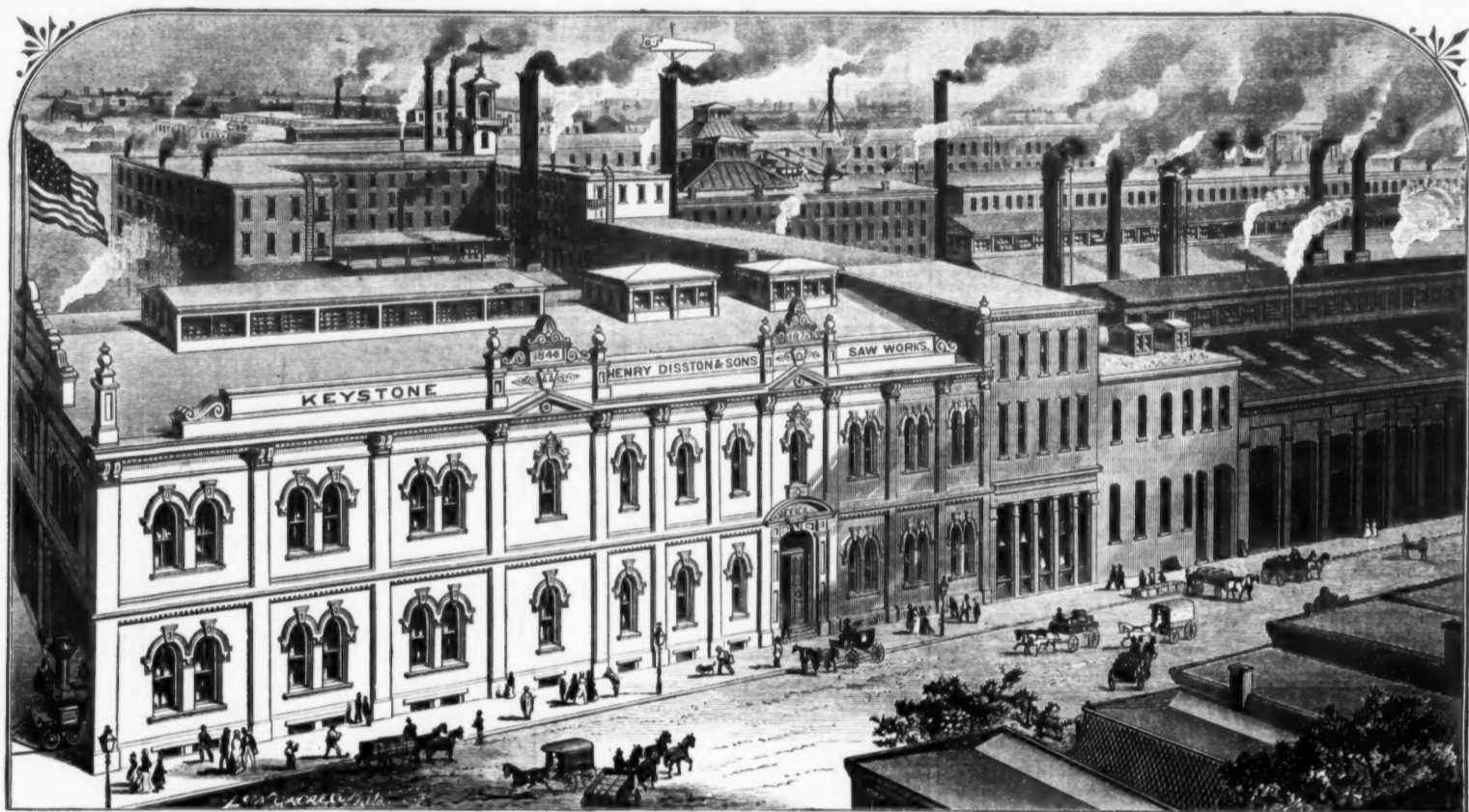
HENRY DISSTON & SONS

Keystone Saw, Tool, Steel & File Works.

FRONT AND LAUREL STREETS, PHILADELPHIA.

Branch Works, Tacony, Philadelphia.

Branch House, Randolph & Market Streets, Chicago. Ill.



These works are the largest of the kind in the world, the main factories at Philadelphia covering over eight acres, and the branch at Tacony extending over four acres of ground.

They supply not only the United States, but their manufactures are known and used throughout England, the Continent of Europe, Japan, Australia and South America.

The following letter from England is as far back as 1867, since which time the trade has continually increased.

MR. HENRY DISSTON :

DEAR SIR,—You will be pleased to learn that your circular saw-blade reached us yesterday safely. We have tried it to-day, and found it more than we expected of it. In every respect it is the best saw we have ever seen, and its equal cannot be produced in Europe. We beg to thank you for all your kind attention to our wishes, and are

LONDON, ENGLAND, November 23, 1867.

Your obliged and obedient servants,

HOLLOWAY & CO.

The articles manufactured by Disston & Sons are fully warranted, and their superior quality is acknowledged by all who have ever used them. These goods are now sold in all the principal markets of the world.

At the Centennial Exhibition, held at Philadelphia in 1876, the display made by this firm was of such marked excellence that the premium was awarded to them for "A VERY LARGE DISPLAY OF SURPASSING EXCELLENCE OF MATERIAL, STYLE AND FINISH."

"EVERY ARTICLE WORTHY OF THE HIGHEST COMMENDATION."

During the Exhibition they received an order from a Hamburg house for over six thousand dollars' worth of goods, and the trade has been continued ever since with mutual satisfaction to both parties, respecting both price and quality. The Japanese, while erecting their building on the grounds, ordered a few saws for trial, and before leaving the country left an order with Disston & Sons for over two hundred dozen saws to be taken to Japan, price and quality both being satisfactory.

Another fact worthy of note is that they sent one hundred and twenty-five dozen of Files to Yokohama, Japan, at a certain invoiced price, and, on receipt of an account sales from their Agents, the accompanying draft was for more than the original account.

The first premium was awarded to Messrs. Disston & Sons at the Exhibition held at Sydney, N. S. W., in 1877, and at all other previous Exhibitions at which their goods were displayed.

The Exhibition Universelle, now being held at Paris, contains a display of the world-renowned manufactures of Henry Disston & Sons.

New York Wholesale Prices, May 1, 1878.

HARDWARE.

Amvils.	
American	100-110-120
Wright's	100-110-120
Armstrong's	100-110-120
Wilkinson's	100-110-120
Easton's (American)	100-110-120
Augsburg	100-110-120
Conn. Valley Mfg. Co.	100-110-120
Douglas Mfg. Co.	100-110-120
Ives	100-110-120
Becker (French Swift & Co.)	100-110-120
Griswold	100-110-120
Kasson's Patent	100-110-120
Cook's, Ives	100-110-120
Snell Mfg. Co.	100-110-120
Jennings	100-110-120
Imitation Jennings	100-110-120
Ives "Jennings" Bits	100-110-120
Lewis' Single Twist Bits	100-110-120
Andrews	100-110-120
Griswold's Patent Bits	100-110-120
Expansive Bits, Clark's, small, 1 1/2 in. large, 2 in.	100-110-120
"Black"	100-110-120
"Parnelle's"	100-110-120
Hollow Augers.	
French Swift & Co.	100-110-120
"Stearns' Adjust."	100-110-120
"Ives' Expansive"	100-110-120
"Universal Expansive"	100-110-120
Gilmet Bits	100-110-120
"Diamond"	100-110-120
"Double Cut Diamond Bits"	100-110-120
"Cl. Valley Mfg. Co."	100-110-120
"Griswold's"	100-110-120
"Ives"	100-110-120
Morse's Bit Stock Drill, List of Jan. 78.	100-110-120
L'Honnemieu's Ship Augers	100-110-120
Watrous Ship Augers	100-110-120
Awl Holes.	
Sewing, Brass	100-110-120
Patent Sewing, Short	100-110-120
"Long"	100-110-120
"Peg, Plain Top"	100-110-120
"Leather Top"	100-110-120
Awls, Brad's.	
Sewing, Common	100-110-120
Sewing, Best	100-110-120
"Shouldered"	100-110-120
"Patent Peg"	100-110-120
"Shouldered Brad"	100-110-120
"Handled Brad"	100-110-120
"Handled Scratch"	100-110-120
"Socket Scratch"	100-110-120
Brad's, Aiken's	100-110-120
"No. 42, 100 No. 43, 112 No. 44, 120 No. 45, 130 No. 46, 140 No. 47, 150 No. 48, 160 No. 49, 170 No. 50, 180 No. 51, 190 No. 52, 200 No. 53, 210 No. 54, 220 No. 55, 230 No. 56, 240 No. 57, 250 No. 58, 260 No. 59, 270 No. 60, 280 No. 61, 290 No. 62, 300 No. 63, 310 No. 64, 320 No. 65, 330 No. 66, 340 No. 67, 350 No. 68, 360 No. 69, 370 No. 70, 380 No. 71, 390 No. 72, 400 No. 73, 410 No. 74, 420 No. 75, 430 No. 76, 440 No. 77, 450 No. 78, 460 No. 79, 470 No. 80, 480 No. 81, 490 No. 82, 500 No. 83, 510 No. 84, 520 No. 85, 530 No. 86, 540 No. 87, 550 No. 88, 560 No. 89, 570 No. 90, 580 No. 91, 590 No. 92, 600 No. 93, 610 No. 94, 620 No. 95, 630 No. 96, 640 No. 97, 650 No. 98, 660 No. 99, 670 No. 100, 680 No. 101, 690 No. 102, 700 No. 103, 710 No. 104, 720 No. 105, 730 No. 106, 740 No. 107, 750 No. 108, 760 No. 109, 770 No. 110, 780 No. 111, 790 No. 112, 800 No. 113, 810 No. 114, 820 No. 115, 830 No. 116, 840 No. 117, 850 No. 118, 860 No. 119, 870 No. 120, 880 No. 121, 890 No. 122, 900 No. 123, 910 No. 124, 920 No. 125, 930 No. 126, 940 No. 127, 950 No. 128, 960 No. 129, 970 No. 130, 980 No. 131, 990 No. 132, 1000 No. 133, 1010 No. 134, 1020 No. 135, 1030 No. 136, 1040 No. 137, 1050 No. 138, 1060 No. 139, 1070 No. 140, 1080 No. 141, 1090 No. 142, 1100 No. 143, 1110 No. 144, 1120 No. 145, 1130 No. 146, 1140 No. 147, 1150 No. 148, 1160 No. 149, 1170 No. 150, 1180 No. 151, 1190 No. 152, 1200 No. 153, 1210 No. 154, 1220 No. 155, 1230 No. 156, 1240 No. 157, 1250 No. 158, 1260 No. 159, 1270 No. 160, 1280 No. 161, 1290 No. 162, 1300 No. 163, 1310 No. 164, 1320 No. 165, 1330 No. 166, 1340 No. 167, 1350 No. 168, 1360 No. 169, 1370 No. 170, 1380 No. 171, 1390 No. 172, 1400 No. 173, 1410 No. 174, 1420 No. 175, 1430 No. 176, 1440 No. 177, 1450 No. 178, 1460 No. 179, 1470 No. 180, 1480 No. 181, 1490 No. 182, 1500 No. 183, 1510 No. 184, 1520 No. 185, 1530 No. 186, 1540 No. 187, 1550 No. 188, 1560 No. 189, 1570 No. 190, 1580 No. 191, 1590 No. 192, 1600 No. 193, 1610 No. 194, 1620 No. 195, 1630 No. 196, 1640 No. 197, 1650 No. 198, 1660 No. 199, 1670 No. 200, 1680 No. 201, 1690 No. 202, 1700 No. 203, 1710 No. 204, 1720 No. 205, 1730 No. 206, 1740 No. 207, 1750 No. 208, 1760 No. 209, 1770 No. 210, 1780 No. 211, 1790 No. 212, 1800 No. 213, 1810 No. 214, 1820 No. 215, 1830 No. 216, 1840 No. 217, 1850 No. 218, 1860 No. 219, 1870 No. 220, 1880 No. 221, 1890 No. 222, 1900 No. 223, 1910 No. 224, 1920 No. 225, 1930 No. 226, 1940 No. 227, 1950 No. 228, 1960 No. 229, 1970 No. 230, 1980 No. 231, 1990 No. 232, 2000 No. 233, 2010 No. 234, 2020 No. 235, 2030 No. 236, 2040 No. 237, 2050 No. 238, 2060 No. 239, 2070 No. 240, 2080 No. 241, 2090 No. 242, 2100 No. 243, 2110 No. 244, 2120 No. 245, 2130 No. 246, 2140 No. 247, 2150 No. 248, 2160 No. 249, 2170 No. 250, 2180 No. 251, 2190 No. 252, 2200 No. 253, 2210 No. 254, 2220 No. 255, 2230 No. 256, 2240 No. 257, 2250 No. 258, 2260 No. 259, 2270 No. 260, 2280 No. 261, 2290 No. 262, 2300 No. 263, 2310 No. 264, 2320 No. 265, 2330 No. 266, 2340 No. 267, 2350 No. 268, 2360 No. 269, 2370 No. 270, 2380 No. 271, 2390 No. 272, 2400 No. 273, 2410 No. 274, 2420 No. 275, 2430 No. 276, 2440 No. 277, 2450 No. 278, 2460 No. 279, 2470 No. 280, 2480 No. 281, 2490 No. 282, 2500 No. 283, 2510 No. 284, 2520 No. 285, 2530 No. 286, 2540 No. 287, 2550 No. 288, 2560 No. 289, 2570 No. 290, 2580 No. 291, 2590 No. 292, 2600 No. 293, 2610 No. 294, 2620 No. 295, 2630 No. 296, 2640 No. 297, 2650 No. 298, 2660 No. 299, 2670 No. 300, 2680 No. 301, 2690 No. 302, 2700 No. 303, 2710 No. 304, 2720 No. 305, 2730 No. 306, 2740 No. 307, 2750 No. 308, 2760 No. 309, 2770 No. 310, 2780 No. 311, 2790 No. 312, 2800 No. 313, 2810 No. 314, 2820 No. 315, 2830 No. 316, 2840 No. 317, 2850 No. 318, 2860 No. 319, 2870 No. 320, 2880 No. 321, 2890 No. 322, 2900 No. 323, 2910 No. 324, 2920 No. 325, 2930 No. 326, 2940 No. 327, 2950 No. 328, 2960 No. 329, 2970 No. 330, 2980 No. 331, 2990 No. 332, 3000 No. 333, 3010 No. 334, 3020 No. 335, 3030 No. 336, 3040 No. 337, 3050 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623, 5910 No. 624, 5920 No. 625, 5930 No. 626, 5940 No. 627, 5950 No. 628, 5960 No. 629, 5970 No. 630, 5980 No. 631, 5990 No. 632, 6000 No. 633, 6010 No. 634, 6020 No. 635, 6030 No. 636, 6040 No. 637, 6050 No. 638, 6060 No. 639, 6070 No. 640, 6080 No. 641, 6090 No. 642, 6100 No. 643, 6110 No. 644, 6120 No. 645, 6130 No. 646, 6140 No. 647, 6150 No. 648, 6160 No. 649, 6170 No. 650, 6180 No. 651, 6190 No. 652, 6200 No. 653, 6210 No. 654, 6220 No. 655, 6230 No. 656, 6240 No. 657, 6250 No. 658, 6260 No. 659, 6270 No. 660, 6280 No. 661, 6290 No. 662, 6300 No. 663, 6310 No. 664, 6320 No. 665, 6330 No. 666, 6340 No. 667, 6350 No. 668, 6360 No. 669, 6370 No. 670, 6380 No. 671, 6390 No. 672, 6400 No. 673, 6410 No. 674, 6420 No. 675, 6430 No. 676, 6440 No. 677, 6450 No. 678, 6460 No. 679, 6470 No. 680, 6480 No. 681, 6490 No. 682, 6500 No. 683, 6510 No. 684, 6520 No. 685, 6530 No. 686, 6540 No. 687, 6550 No. 688, 6560 No. 689, 6570 No. 690, 6580 No. 691, 6590 No. 692, 6600 No. 693, 6610 No. 694, 6620 No. 695, 6630 No. 696, 6640 No. 697, 6650 No. 698, 6660 No. 699, 6670 No. 700, 6680 No. 701, 6690 No. 702, 6700 No. 703, 6710 No. 704, 6720 No. 705, 6730 No. 706, 6740 No. 707, 6750 No. 708, 6760 No. 709, 6770 No. 710, 6780 No. 711, 6790 No. 712, 6800 No. 713, 6810 No. 714, 6820 No. 715, 6830 No. 716, 6840 No. 717, 6850 No. 718, 6860 No. 719, 6870 No. 720, 6880 No. 721, 6890 No. 722, 6900 No. 723, 6910 No. 724, 6920 No. 725, 6930 No. 726, 6940 No. 727, 6950 No. 728, 6960 No. 729, 6970 No. 730, 6980 No. 731, 6990 No. 732, 7000 No. 733, 7010 No. 734, 7020 No. 735, 7030 No. 736, 7040 No. 737, 7050 No. 738, 7060 No. 739, 7070 No. 740, 7080 No. 741, 7090 No. 742, 7100 No. 743, 7110 No. 744, 7120 No. 745, 7130 No. 746, 7140 No. 747, 7150 No. 748, 7160 No. 749, 7170 No. 750, 7180 No. 751, 7190 No. 752, 7200 No. 753, 7210 No. 754, 7220 No. 755, 7230 No. 756, 7240 No. 757, 7250 No. 758, 7260 No. 759, 7270 No. 760, 7280 No. 761, 7290 No. 762, 7300 No. 763, 7310 No. 764, 7320 No. 765, 7330 No. 766, 7340 No. 767, 7350 No. 768, 7360 No. 769, 7370 No. 770, 7380 No. 771, 7390 No. 772, 7400 No. 773, 7410 No. 774, 7420 No. 775, 7430 No. 776, 7440 No. 777, 7450 No. 778, 7460 No. 779, 7470 No. 780, 7480 No. 781, 7490 No. 782, 7500 No. 783, 7510 No. 784, 7520 No. 785, 7530 No. 786, 7540 No. 787, 7550 No. 788, 7560 No. 789, 7570 No. 790, 7580 No. 791, 7590 No. 792, 7600 No. 793, 7610 No. 794, 7620 No. 795, 7630 No. 796, 7640 No. 797, 7650 No. 798, 7660 No. 799, 7670 No. 800, 7680 No. 801, 7690 No. 802, 7700 No. 803, 7710 No. 804, 7720 No. 805, 7730 No. 806, 7740 No. 807, 7750 No. 808, 7760 No. 809, 7770 No. 810, 7780 No. 811, 7790 No. 812, 7800 No. 813, 7810 No. 814, 7820 No. 815, 7830 No. 816, 7840 No. 817, 7850 No. 818, 7860 No. 819, 7870 No. 820, 7880 No. 821, 7890 No. 822, 7900 No. 823, 7910 No. 824, 7920 No. 825, 7930 No. 826, 7940 No. 827, 7950 No. 828, 7960 No. 829, 7970 No. 830, 7980 No. 831, 7990 No. 832, 8000 No. 833, 8010 No. 834, 8020 No. 835, 8030 No. 836, 8040 No. 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8760 No. 909, 8770 No. 910, 8780 No. 911, 8790 No. 912, 8800 No. 913, 8810 No. 914, 8820 No. 915, 8830 No. 916, 8840 No. 917, 8850 No. 918, 8860 No. 919, 8870 No. 920, 8880 No. 921, 8890 No. 922, 8900 No. 923, 8910 No. 924, 8920 No. 925, 8930 No. 926, 8940 No. 927, 89	

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Footings	20
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" Sheet	30
Gum, Copal	100
" Damar	250
" Shellac, English	50
" " dark	40
Litharge, English	100
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6 X 8 to 10 X 15	\$ 7.50	\$ 6.75	\$ 6.25	\$ 5.75
11 X 14 to 16 X 24	8.50	7.75	7.25	6.50
13 X 22 to 20 X 36	10.75	9.75	9.25	8.50
15 X 26 to 24 X 36	12.25	10.75	10.25	9.50
20 X 28 to 24 X 36	13.00	11.50	11.00	10.25
25 X 32 to 28 X 44	14.50	13.25	12.75	12.00
26 X 36 to 30 X 48	15.00	13.75	13.25	12.50
30 X 36 to 30 X 48	16.50	14.50	14.00	13.00
30 X 40 to 34 X 56	17.25	15.00	14.50	13.50
34 X 38 to 34 X 56	18.25	15.75	15.25	14.50
30 X 40 to 40 X 60	20.75	18.75	17.25	

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6 X 8 to 10 X 15	\$12.00	\$11.00	\$10.00	\$ 9.5
11 X 14 to 16 X 24	13.75	12.50	11.75	10.5
13 X 22 to 20 X 36	15.75	14.75	14.00	13.00
15 X 26 to 24 X 36	16.75	15.25	14.50	
20 X 28 to 24 X 36	21.00	18.50	17.75	
25 X 32 to 28 X 44	23.25	20.25	19.50	
26 X 36 to 30 X 48	24.00	21.50	20.75	
30 X 36 to 30 X 48	25.75	23.25	22.50	
30 X 40 to 34 X 56	27.25	25.00	24.25	
34 X 38 to 34 X 56	29.25	27.00	26.00	
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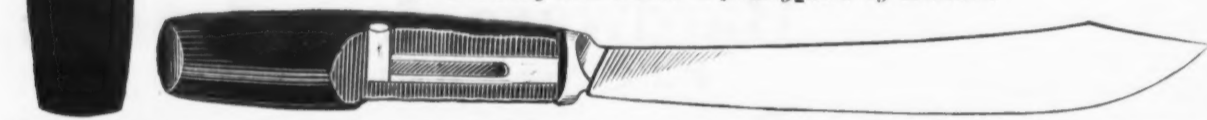
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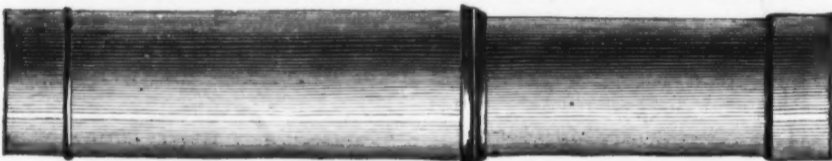
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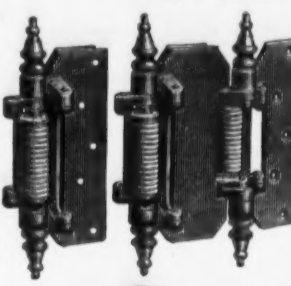
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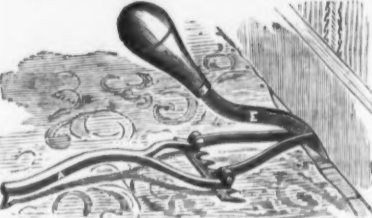
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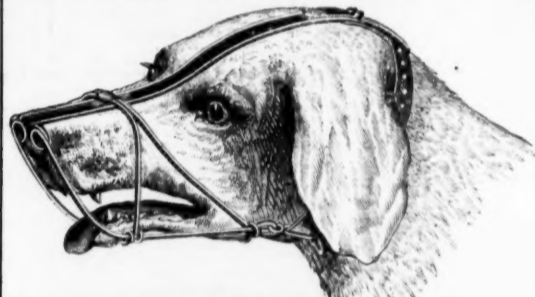
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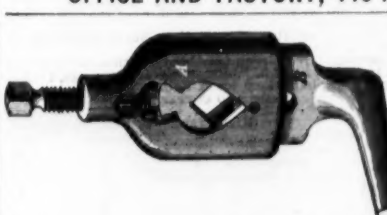
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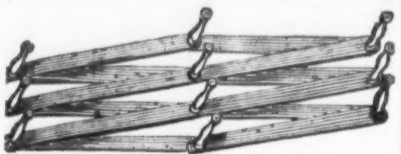
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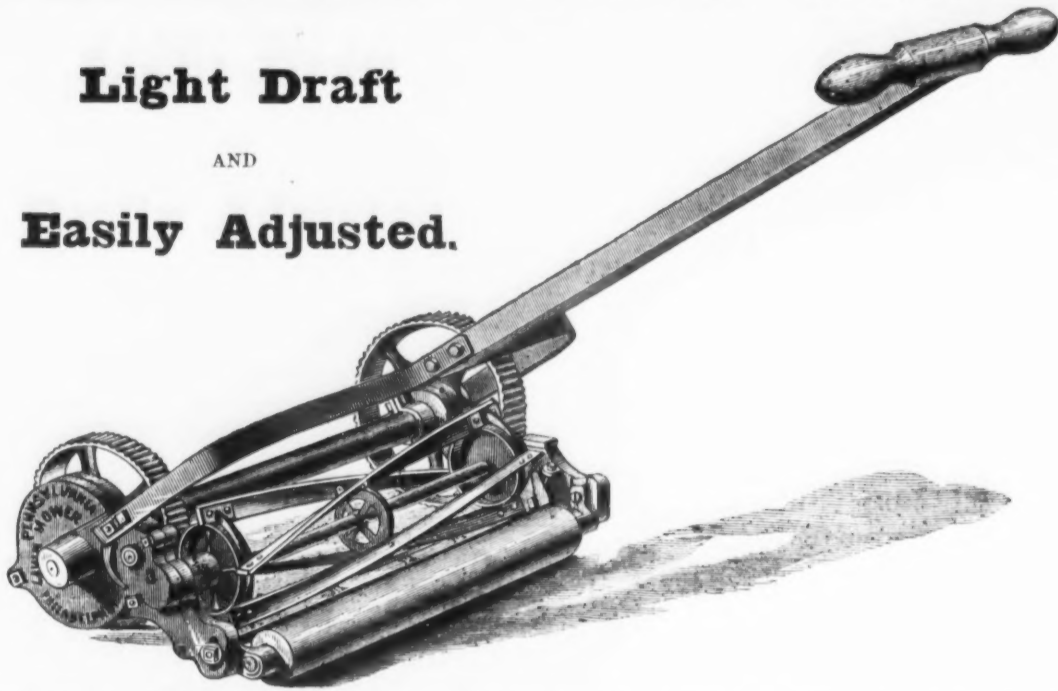
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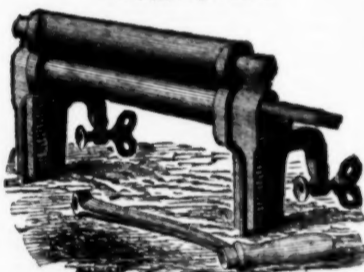
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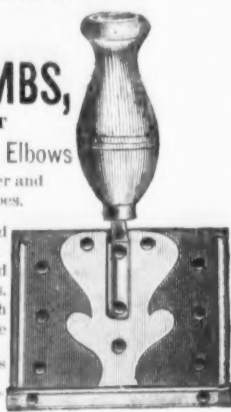
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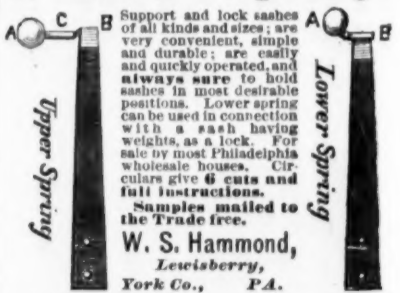
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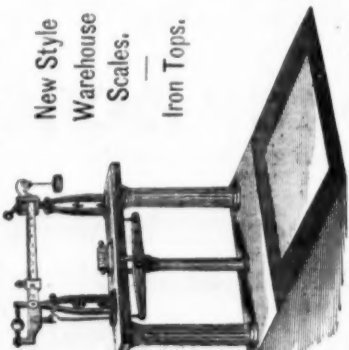
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SAD IRONS.



And Other

HARDWARE SPECIALTIES.

Office and Factory,

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MANUFACTURED BY

The American Lock Mfg. Co.,Are the most **SECURE** and **DURABLE** ever made.**SECURE**

Because they have 40 Brass Tumblers, independent in their action, either one of which will prevent the lock from being opened unless brought to proper position by the Key.

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Because we use no Springs to break or get out of place.

THEY HAVE

STERLING METAL KEYS

That will not corrode or wear, and are stronger than steel.



FULL SIZE OF KEY.

Upright Rim Dead Locks,
Horizontal Rim Night Latches,
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Fronts and Knobs,

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Solid Bronze Padlocks.

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These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, Case-Hardened throughout, and not only combine all of the superior qualities of our cylinder or Gas Pipe Wrenches, but also all requisite combinations of a regular Nut Wrench, thus making a Combination which has no equal.

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Established in 1839.

A. G. COES & CO.

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Manufacturers of

THE GENUINE

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Our goods have been very much improved recently, by making the Bar *WIDE*, as shown in the cut, which makes a 12 in. Wrench as strong as a 15 in. made in the ordinary way, and by using

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NEW PATENT

FERRULE

Which cannot be forced back into the handle.

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We call particular attention to our new Patent Ferrule, with its supporting Nut (shown in section in the above cut), which makes the strongest Ferrule fastening known.

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Our Agents, GRAHAM & HAINES, 113 Chambers St. New York, carry a full line of our goods, and will be pleased to serve you at factory prices.

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Handles. Also

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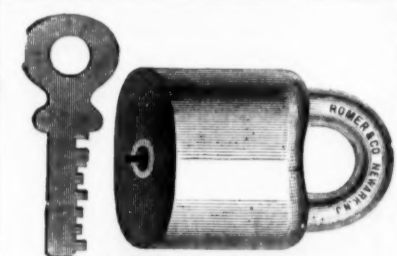
Railroad Switches, Freight Cars,
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All sizes, with Brass and Steel
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Passenger Car Locks,
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Patent Tubular Night Latches.

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This is the most *Durable* and *Simple* Portable Pump made, is very light and
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**WATERING GARDENS AND CONSERVATORIES,
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SAFEGUARD AGAINST FIRE.**

Throwing a Steady Stream of Water 50 Feet.

The Pump can be worked by a Lady or Child, affording amusement, as well
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Discount to the Trade.

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New Series.

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Ives' Patent Improved Expansive Bit.



The internal arrangement of these Braces has been so changed as to avoid any foundation for a
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FORCED SET SCREWS,

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TAP BOLTS.



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Carriage & Tie Bolts, ordinary orders	75¢	3¢	off	net
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Pat. Hot Pressed Sq. and Hex. Nuts	30¢	8¢	off	net
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This tool is made on an entirely new principle, and is pronounced superior to any tool made for the purpose.

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Machine and Square Head Bolts.....	60¢10	% off net
Coach and Lag Screws.....	60¢10	% off net
Bolt Ends.....	60¢10	% off net
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Bucket Plunger. **VALLEY MACHINE CO.** Acme Steam Pump.
STEAM PUMP
Manufacturers,
Wright's Patent. Easthampton. - Massachusetts. Mayher's Patent.

Empire Gum-Core Packing.

Patented Dec. 27th, 1870, and April 4th, 1871.



The First Self-Lubricating Gum-Core Packing.

The only one receiving Medal, Certificate of Award, and Report from Judges at Centennial International Exhibition, at Philadelphia in 1876.



We have scores of testimonials from reliable parties who have used the "Empire" from five to ten years, and give a few samples; but the best evidence of its being the very best in the market, is the fact that so many unscrupulous parties are imitating it as near as they dare, and trying to make sales for their cheap material on the reputation of the "Empire," representing to have something equally as good at a lower figure, always making the "Empire" the basis of operations.

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Messrs. Wm. M. Canfield & Co.—GENTLEMEN: We have now used your Empire Packing in the pumps of these works the past three years. We have run the same Packing without renewal for 18 months; the time saved in stopping to repack has more than twice paid for the Packing used. It is the best Packing ever invented.
JOSEPH MOYER, Engineer.
N. B.—Still in use here, making a service of 10 years.

The claims of the "Empire" to superiority are firmly established, and it is fast superseding all other kinds of Packing. It is alike adapted to Stationary, Locomotive and Marine Engines, Hot and Cold Water Pumps.

Write for new discounts to dealers and consumers.
CANFIELD MANUFACTURING COMPANY,
127 N. Seventh St., Philadelphia, Pa.

The Eureka Steam & Hydraulic Packing.

SYMONDS & CO., 120 Exchange Place, Phila., Sole Manufacturers.



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In reply to certain unscrupulous parties who assert that we make their goods a basis to sell our own, we have only to say that such an assertion is too puerile and silly for us to notice, and that so far as imitating is concerned, we have no desire to imitate an article that has (as far as our knowledge goes) been condemned by three-fourths of such engineers as have given it a trial; nor are we obliged to give our goods various names and prices to effect sales. We intend to maintain in the future the reputation the Eureka Packing has attained, by giving it the same standard of excellence we have in the past; and, further, we would say a practical test is a better proof of merit than all the medals ever bestowed.
Beware of spurious imitations.
SYMONDS & CO.
OPINIONS OF PRACTICAL ENGINEERS.

INTERNATIONAL EXHIBITION CO., CENTENNIAL GROUNDS, PHILADELPHIA, Aug. 16th, 1877.
This is to certify that I have used the Eureka Steam Packing on the piston and valve rod of the Buckeye Engines furnishing power for the machinery at the Permanent Exhibition, and I take pleasure in saying that it is an A-1 Packing. I pay scarcely any attention to the stuffing boxes since using it, and they are always tight. The effect on the rods is to make them smooth and bright, and keep them so.

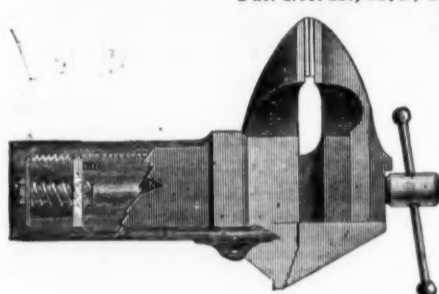
WASHINGTON, D. C., TREASURY DEPARTMENT, April 22d, 1878.
Messrs. Symonds & Co.—GENTLEMEN: I have been using your Eureka Packing for a year, and in a long experience I find it the most durable and economical Packing for steam and water I have ever used.
Respectfully,
JAMES VERMILLION, Chief Engineer.

Office of LEHMAN & BOLTON, Philadelphia, June 17th, 1877.
Messrs. Symonds & Co.—GENTLEMEN: In reply to your inquiry in regard to how your Packing performs, I am happy to say I find it A-1. I have used every kind of Packing that has come to my knowledge, in an experience of many years as engineer, but have never used or found anything of its kind that has given me as good satisfaction. I most cheerfully recommend it to all engineers who desire a good Packing.
SAMUEL FISH, Engineer, Goldsmith Hall.

WICKERSHAM & CO., Sole Agents, 59 South Fourth St., Philadelphia.
JOHN MILES, MILWAUKEE, Wis., Traveling Salesman.

"TRENTON" RAPID TRANSIT VISES.

Pat. Nov. 1st, 1870; Feb. 12th, 1877.



PARALLEL Swivel and Coachmakers' VISES.
The Best Rapid Adjustable Vise in the Market.

Simple and durable. No chance of getting out of order. No toggle or cam movements or parts. A trial will convince.

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TRENTON VISE & TOOL WORKS, Trenton, N. J.

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Price, \$5.00.
In Altered Case,
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MICROMETER CALIPER,
Made by THE VICTOR SEWING MACHINE CO.,
Middletown, Conn.

This attractive and very desirable tool will be found more reliable and convenient than the Vernier Caliper, and to Machinists and Tool makers it is indispensable on work requiring very accurate and close measurement. Its capacity is one inch, and is graduated to one thousandths, but can readily be set one-half and quarter thousandths; and is so constructed that any wear resulting from use can be readily adjusted.



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(Double and Single Gate, 1/2 in. to 48 in.—outside and inside Screws, Indicator, &c.
for Gas, Water and Steam. Send for Circular.

Also FIRE HYDRANTS.

L. M. RUMSEY & CO.,

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Witherell's and Churchill's Patent

RUBBER BUCKETS, PUMP CHAIN AND FIXTURES

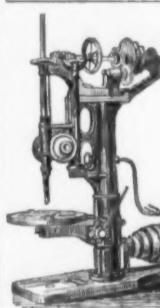
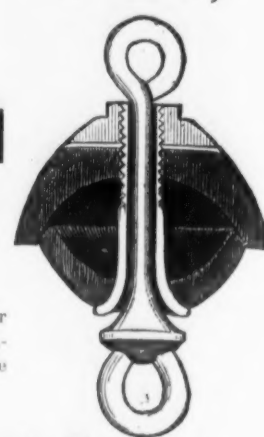
For Chain Pumps.



These Patents cover the use of the Rubber, the use of the Nut and Bolt for expanding, the use of the Tube and Valve for draining. All others are infringers, and manufacturers and dealers in infringing Buckets will be prosecuted to the full extent of the law.

For Rubber Buckets, Chain Tubing, Curbs and Fixtures, address

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UPRIGHT DRILLS.

New Patterns, Geared Heads, Three Change, Hand & Power Feed, Quick Return to Spindle.

A Splendid Tool. CHEAP.

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Are the Cheapest and Best.

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BAXTER'S
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of 1877, of one horse-power, complete \$125; can be seen in operation at my store. I will furnish specifications and estimates for all kinds of Machinery. Send for descriptive circular and price. Address **J. C. TODD,** 10 Barclay St., N.Y., or Paterson, N.J.

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We invite attention to the superior construction of this chuck. Its working parts are absolutely protected from dirt and chips. It is strong, compact and durable, and will hold the greatest variety of work, as the jaws are adjustable with a range the full diameter of the chuck. For Price List address: **Lambertville Iron Works, Lambertville, N. J.**

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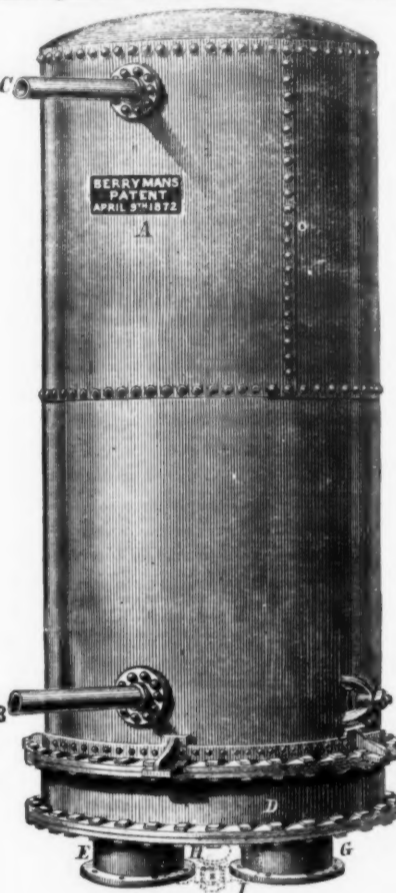
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Manufacturers of all kinds of Machinery, including Steam Engines, Boilers, and all kinds of Iron and Steel Work.
POWER-DRIVEN SHAFTING
With Patent Self-Oiling Bearings.
Pulleys from 1 inch to 10 feet in diameter.
Power Hoisting Machines, Patent Friction Pulleys.

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Eddy Valves.
All Styles and Sizes.

Made (and patents owned) by
THE MOHAWK & HUDSON MFG CO.,
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Heater Complete.

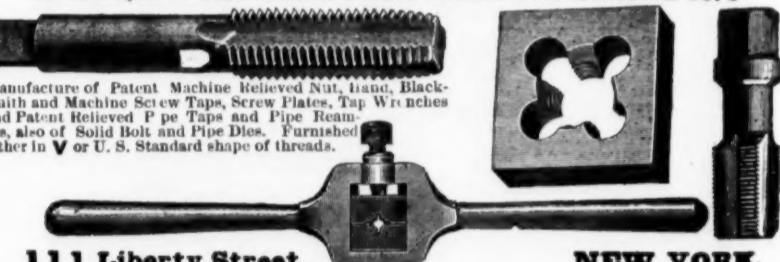
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"Saves 4 tons coal out of 20."—Martin Nixon & Co., Philadelphia, Pa.
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CENTENNIAL EXHIBITION PRIZE MEDAL AWARDED.
WARRANTED.

The Double Screw Parallel "Leg" Vise



Stronger than any other, whether of Foreign or of American make; always parallel and holding with a tighter grip. The jaws are of convenient shape for the workman to get near his work equally well for filing or chipping. Instead of the heavy, clumsily formed jaws of the cast iron Single Screw Vises of the common "parallel" type.
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The jaws are of best Tool Cast Steel, welded on, file cut and properly hardened. The screws are forged of the best refined iron, and work in solid cut thread boxes. The lower screw maintains the parallel position of the two jaws, by having exact motion with the upper working screw through the connecting chain which regulates it. The chain has no strain on the work upon it, and is therefore as durable as all the other parts.

REDUCED PRICE LIST.

No. 1, Jaws 3 1/2 in. x 1 1/2 in., Screws 1/2 in. diameter, Lever 9 in. long, opens 14 in. \$7.00
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All sizes of these Vises furnished with swivel Attachment at same price.

THESE GOODS ARE SOLD BY THE GENERAL AGENTS (with special discounts to the trade.)

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FISHER & NORRIS, Sole Manufacturers, Trenton, N. J.

Moore's Anti-Friction Sliding Door Sheave.

The Cut Shows Exact Size of the 4-inch Wheel.



The hub of the wheel revolves within a set of case-hardened iron roller. The parts are all accurately fitted by lathe work, insuring an easy and noiseless motion, with great strength. The friction being that of rolling surfaces only, the sheave requires no oiling. It is very simple in its construction, and there is no tendency to get out of order. It is strongly made and handsomely finished, and is greatly superior to any anti-friction sheave in the market.

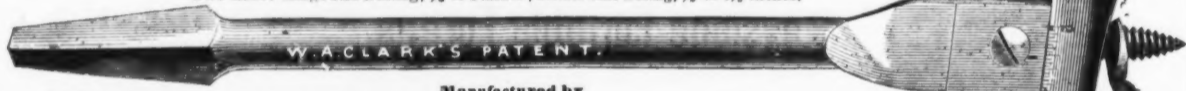
ALSO MANUFACTURERS OF
Parlor Door Hangers, Moore's Anti-Friction,
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S. H. & E. Y. MOORE, 68 Lake St., Chicago.

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CLARK'S PATENT EXPANSIVE BITS

Made of JESSOP'S BEST CAST STEEL, and warranted superior to any other
Two sizes: Large Size Boring, 3/4 to 3 inches; Small Size Boring, 1/4 to 1 1/2 inches.



Manufactured by

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BOSTON.

Reported by Macomber, Bigelow & Douse, 156 to 161
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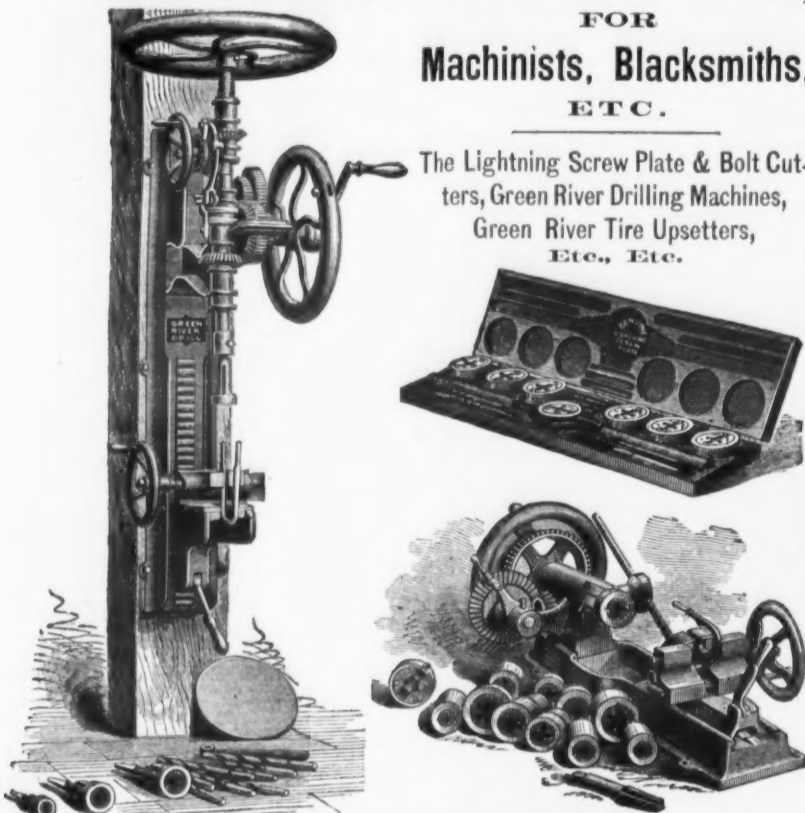
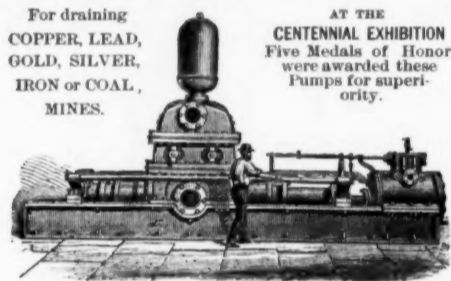
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"Racer"..... 8 00
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Stubb's Tapers, genuine, 3 in., 1 1/2; 3 1/2; 4 1/2; 5 1/2; 6 1/2; 7 1/2; 8 1/2; 9 1/2; 10 1/2; 11 1/2; 12 1/2; 13 1/2; 14 1/2; 15 1/2; 16 1/2; 17 1/2; 18 1/2; 19 1/2; 20 1/2; 21 1/2; 22 1/2; 23 1/2; 24 1/2; 25 1/2; 26 1/2; 27 1/2; 28 1/2; 29 1/2; 30 1/2; 31 1/2; 32 1/2; 33 1/2; 34 1/2; 35 1/2; 36 1/2; 37 1/2; 38 1/2; 39 1/2; 40 1/2; 41 1/2; 42 1/2; 43 1/2; 44 1/2; 45 1/2; 46 1/2; 47 1/2; 48 1/2; 49 1/2; 50 1/2; 51 1/2; 52 1/2; 53 1/2; 54 1/2; 55 1/2; 56 1/2; 57 1/2; 58 1/2; 59 1/2; 60 1/2; 61 1/2; 62 1/2; 63 1/2; 64 1/2; 65 1/2; 66 1/2; 67 1/2; 68 1/2; 69 1/2; 70 1/2; 71 1/2; 72 1/2; 73 1/2; 74 1/2; 75 1/2; 76 1/2; 77 1/2; 78 1/2; 79 1/2; 80 1/2; 81 1/2; 82 1/2; 83 1/2; 84 1/2; 85 1/2; 86 1/2; 87 1/2; 88 1/2; 89 1/2; 90 1/2; 91 1/2; 92 1/2; 93 1/2; 94 1/2; 95 1/2; 96 1/2; 97 1/2; 98 1/2; 99 1/2; 100 1/2; 101 1/2; 102 1/2; 103 1/2; 104 1/2; 105 1/2; 106 1/2; 107 1/2; 108 1/2; 109 1/2; 110 1/2; 111 1/2; 112 1/2; 113 1/2; 114 1/2; 115 1/2; 116 1/2; 117 1/2; 118 1/2; 119 1/2; 120 1/2; 121 1/2; 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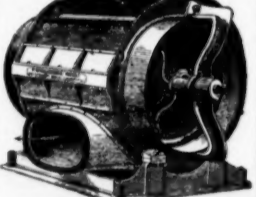
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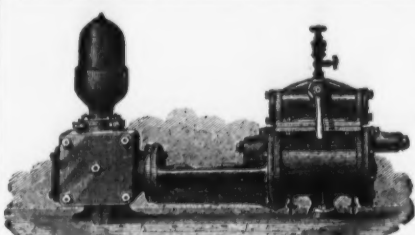
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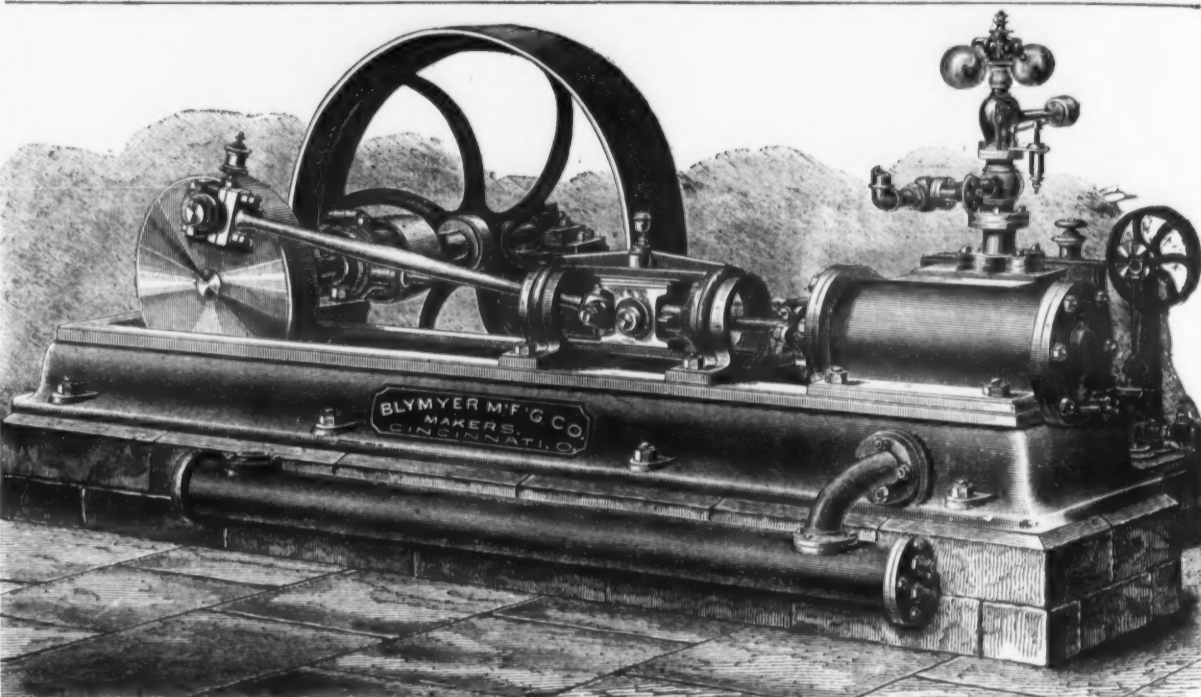
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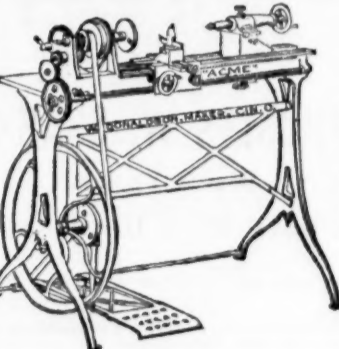
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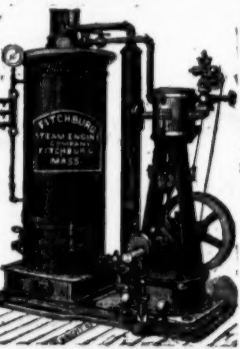
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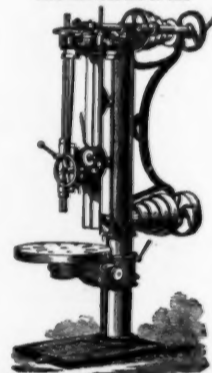
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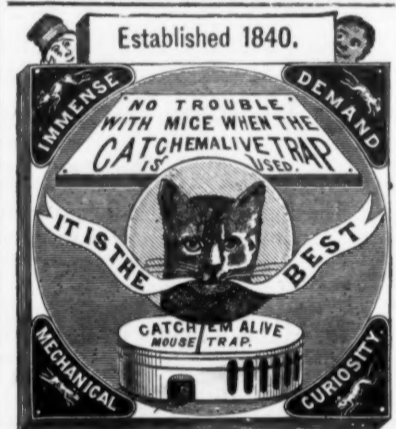
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 See cut of Elevator Hoisting Machine in issue of April 18, 1876, page 30.

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TRIAL OF THE IMPROVED LIGHTNING SAW.

The Emperor, Dom Pedro, accompanied by Director General Goshorn, Superintendent Albert, and others, visited Machinery Hall, at the Centennial on the evening of June 28th. Among other things inspected, at the invitation of E. M. BOYNTON, of New York, they witnessed a trial of the *New Lightning Saw*, patented March 26, 1876. Two men, with one of these saws, cut off a sound log of gum-wood, one foot extreme diameter, in seven seconds, or at the rate of a cord of wood in five minutes. Messrs. Corliss, Morell, Lynch, and other members of the commission, witnessed the trial and timed the cutting. The Emperor remarked, That was fast, very fast cutting. Last evening the Emperor made another examination of the saw.—*Philadelphia Press*, June 30.

"BOYNTON'S SAWS were effectually tested before the judges at the Philadelphia Fair, July 6th and 7th. An ash log, eleven inches in diameter, was sawed off, with a four-and-a-half-foot lightning cross-cut, by two men, in precisely six seconds as timed by the chair man of the Centennial Judges of Class Fifteen. The speed is unprecedented, and would cut a cord of wood in four minutes. The representatives of Russia, Austria, France, Italy, Spain, Belgium, Sweden, England, and several other countries, were present, and expressed their high appreciation."

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